DCS & Labelling Worldwide

SBPL PROGRAMMING REFERENCE

For printer models:

GL4xxe

Read this Programming Guide before and during any development work in SBPL. Keep this Guide handy for future reference.

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to ensure peace of mind during your usage of SATO products

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	<ESC>~a	Cut, Job	3-2
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	<ESC>AO	Auto Online	3-2
	<ESC>A1	Media Size	3-2
	<ESC>&	Form Overlay, Store	3-2
	<ESC>AR	Standard Print Area	3-2
	<ESC>&R	Form Overlay, Recall	3-2
	<ESC>&S	Form Overlay, Store	3-2
	<ESC>*	Clear (Memory Card)	3-3
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1

INTRODUCTION

- **About This Manual**
- **Print Area Calculation**

ABOUT THIS MANUAL

This manual is laid out consistent with the product discussed and provides all of the information required for printer programming.

This manual also incorporates the use of special information boxes. Examples of these boxes and the type of information provided in each, are below.

WARNING: PROVIDES INFORMATION THAT, IF UNHEEDED, MAY RESULT IN PRESONAL INJURY.

CAUTION: PROVIDES INFORMATION THAT, IF UNHEEDED, MAY RESULT IN EQUIPMENT DAMAGE.

NOTE: Provides helpful hints to assist in performing the tasks at hand.

LCD DISPLAY: Provides the specific display that should be visible on the LCD at that point.

A comprehensive Table Of Contents provided at the front of this manual facilitates rapid movement within. The contents identify the different Units, Chapters, and Sections. Each references the page number of their commencement.

The pages of this manual have embedded headers and footers to assist the user in identifying his or her exact position within the manual. The header provides the unit number followed by its name. The footer identifies the product on the left and the page number to the right side of the page.

Page enumeration is two-part with each separated by a hyphen. The first character set references the Unit and the second identifies the page number. Page numbers begin with the numeral (1) one at the commencement of a new unit and ascends sequentially.

PRINT AREA CALCULATION

Many print applications may not require labels that fill the entire printable area of the printer. Therefore it is important to understand how to calculate print size so that the printed image does not exceed the label size.

There are two axis to consider when calculating for print position; horizontal and vertical. The horizontal axis is lateral positioning parallel with the print head and is measured from the right side of the media to the left. The vertical axis is the label length from the front to its rear.

This juncture point of the horizontal and vertical axis is referred to as the Base Reference Point (or zero point) and all measurement is incremental along those axis' from there. The allowable ranges for these references is dependent on the particular printer to accommodate different print widths and resolutions.

A1 COMMAND

The A1 command is the preferred method of configuring the printer for media size. If using media smaller than the print head width, use this command to specify the media size and adjust the start position corresponding to that. The backing paper must be included in media size considerations. This command would be as follows:

<A1>aaaaabbbb

a = Height of Label
b = Width of Label

> NOTE: The valid ranges for each of the above may be found in the product manuals.

A3 COMMAND

Before beginning to send code, one must perform some simple calculations to determine print positioning. Firstly, determine the print resolution and maximum print width of the printer. This information is provided in the Technical Data unit of the Operator Manual and Service Manuals.

The print resolution of the print head has a direct bearing on the "dots per inch" (DPI) of print density. The corresponding formula for a 203 Resolution print head on a printer with 4.1 Maximum Print Width would be:

Resolution (DPI) x Maximum Printable Width (Linear Inches) =
Maximum Printable Width (Linear Dots)

203 (DPI) x 4.1 (Linear Inches) = 832 (Linear Dots)

Once this is done, one must calculate the label width in linear dots. That formula would be as follows for a 2 inch wide label:

Resolution (DPI) x Label Width (Linear Inches) =
Label Width (Linear Dots)

203 (DPI) x 2.0 (Linear Inches) = 406 (Linear Dots)

Lastly, one must calculate the horizontal distance to offset printing to accommodate for the difference in size from the printer's maximum printable width to the label width. That formula would be as follows using the above examples:

Maximum Printable Width (Linear Dots) - Label Width (Linear Dots) = Print Offset (Linear Dots)

832 (Linear Dots) - 406 (Linear Dots) = 426 (Linear Dots)

In the above example, 426 would be the required command entry to reset the initial base reference point (or zero point) to the new base reference point (or zero point) based on the label's width.

Note that with each additional horizontal or vertical adjustment, the New Base Reference Point will always be positioned relative to the last base reference point - not the Initial Base Reference Point. In other words, the only way to return to the Initial Base Reference Point is to either commands to reverse the prior commands or to delete all positioning commands to return the printer to its default state.

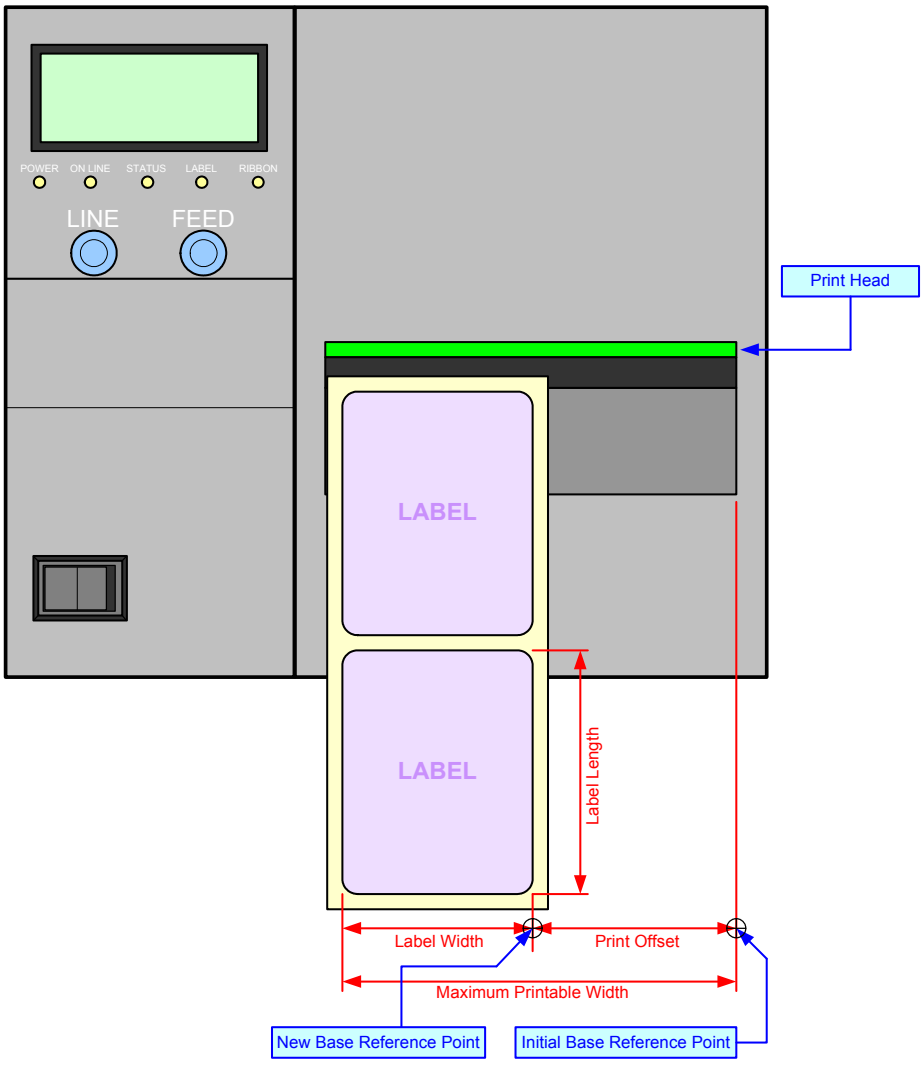

Figure 1-1, Print Area Calculation

2

PROGRAMMING CONCEPTS

- **Programming Language**
- **Selecting Protocol Codes**
- **Using Basic**
- **Print Position Commands**
- **GL-specific Commands**

PROGRAMMING LANGUAGE

A programming language for a printer is a familiar concept to most programmers. It is a group of commands that are designed to use the internal intelligence of the printer. The commands, which are referred to as SATO Command Codes, contain non-printable ASCII characters (such as **<STX>**, **<ETX>**, **<ESC>**) and printable characters. These commands must be assembled into an organized block of code to be sent as one data stream to the printer, which in turn interprets the command codes and generates the desired label output. The programmer is free to use any programming language available to send the desired data to the printer.

The printer command codes used are based upon “Escape” (1B hexadecimal) sequences. Typically there are four types of command sequences:

<ESC>{Command}

These commands generally tell the printer to perform a specific action, like “clear the memory.”

<ESC>{Command} {Data}

Commands with this format tell the printer to perform a specific action which is dependent upon the following data, like “print X labels”, where the value for X is contained in the data.

<ESC>{Command} {Parameter}

These commands set the operational parameters of the printer, like “set the print speed to 3.”

<ESC>{Command} {Parameter} {Data}

Some commands can contain both Parameter and Data elements, such as “print a Code 39 symbol containing the data.”

SELECTING PROTOCOL CODES

Protocol codes are the special control characters that prepare the printer to receive instructions. For example, the **<ESC>** character tells the printer that a command code will follow and the **<ENQ>** character asks for the printer status.

There are two pre-defined different sets of Protocol Control codes to choose from. Each set is made up of six special characters. The Standard Protocol Control codes are non-printable characters, and the Non-Standard Protocol Control codes are printable characters. The Non-Standard set may be useful on host computers using protocol converters or in an application where non-printable ASCII characters cannot be sent from the host.

> This manual uses the Standard Protocol Control codes for all of the examples. Alternately, the user may define and download a set of custom Protocol Control Codes (see Appendix D).

PROTOCOL CODES		
CONTROL CHARACTER	**STANDARD DSW2-7 OFF**	**DESCRIPTION**
STX	02 Hex	Data start
ETX	03 Hex	Data end
ESC	1B Hex	Command Code to follow
ENQ	05 Hex	Get printer status, Bi-Com Mode
CAN	18 Hex	Cancel print job, Bi-Com mode
Off-Line	40 Hex	Take printer Off-Line

USING BASIC

It may be useful to test your printer using a BASIC program on a PC or write your actual production programs in BASIC. Whatever the reason, if working in BASIC, some of the following hints may be helpful.

Set the WIDTH of the output device to 255 characters to avoid automatically sending <CR> and <LF> characters after every line. The command string should be continuous and uninterrupted by <CR> and/or <LF> commands. The examples given in this manual are printed on separate lines because they will not fit on a single line and do not contain <CR> and/or <LF> characters. If these characters are needed, they are explicitly noted by the inclusion of <CR> and <LF> notations.

If using the printer's RS232C interface, it is necessary to set the computer COM portion so the CTS and DSR signals are ignored. Send OPEN "COM" statements as follows:

OPEN "COM1:9600,E,8,1,CS,DS"AS #1

This sets the host computer's COM1 port RS232C communication parameters for 9600 baud, Even parity, 8 Data bits, 1 Stop bit and directs the port to ignore the CTS and DSR control signals.

It may be desirable to assign the <ESC> character to a string variable to reduce keystrokes since this character is often used.

The following two examples use Standard Protocol codes in BASIC.

PRINTING WITH THE PARALLEL PORT	
5 REM CL612 Parallel Example	Identifies the program as a CL612 parallel port print label. The "REM" prevents this data from being sent to the printer and is only displayed on the screen.
10 E$=CHR$(27)	Sets the "E$" string as an <ESC> character
20 WIDTH "LPT1",255	Sets the width of the output to 255 characters
30 LPRINT E$;"A";	Sends an "<ESC>A" command code to the LPT1 parallel port
40 LPRINT E$;"H400";E$;"V100";E$;"XL1SATO";	Sends the data "SATO" to be to be placed 400 dots horizontally and 100 dots vertically on the label and printed in the "XL" font.
50 LPRINT E$;"Q1";	Instructs the printer to print one label.
60 LPRINT E$; "Z";	Tells the printer that the last command has been sent. The printer can now create and print the job.

PRINTING WITH THE RS232C PORT	
5 REM CL612 Parallel Example	Identifies the program as a CL612e RS232C port print label. The “REM” prevents this data from being sent to the printer and displays it only on the screen.
10 E$=CHR$(27)	Sets the“E$”string as an <ESC>character.
OPEN “COM1:9600,N,8,1,CS,DS”AS #1	Opens the COM1 port for output and sets the parameters as 9600 baud, No parity, 8 Data bits, 1 Stop bit and instructs the port to ignore the CTS and DSR control signals.
30 PRINT #1,CHR$ (2);	Sends an <STX> (ASCII Code a decimal “2”) to the printer instructing it to prepare to receive a message.
50 PRINT #1,E$;"A";	Sends an “<ESC>A” command code to Print Port #1 opened by statement 20 above.
60 PRINT#1, E$; "H400"; E$; "V100"; E$; "XL1SATO"	Sends the data “SATO” to be placed 400 dots horizontally and 100 dots vertically on the label and printed in the “XL” auto smoothed font.
50 PRINT #1, E$;"Q1";	Instructs the printer to print a quantity of one label.
60 PRINT #1, E$; “Z”;	Informs the printer that the last command has been sent and printing can occur.
70 PRINT #1,CHR$ (3);	Sends an <ETX> (ASCII Code decimal “3”) informs the printer of message end. Identifies the program as a CL612e RS232C port print label. The “REM” prevents this data from being sent to the printer and displays it only on the screen.

PRINT POSITION COMMANDS

There are three methods using command codes to properly orient print images on a label. They are as follows:

MEDIA SIZE COMMAND

The Media Size Command (<ESC>A1) allows specification of the label width and length so the printer may automatically adjust itself relative to the command entry. However, the label size specified and the actual label size must match.

Example: <ESC>A1aaaaabbbb

a = Label Length
b = Label Width

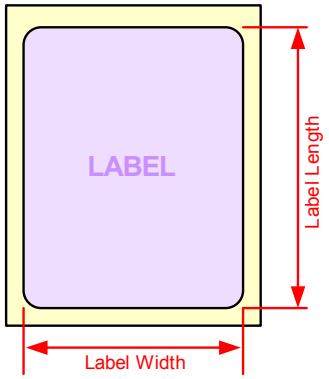

Figure 2-1, Media Measurement

BASE REFERENCE POINT COMMAND

The Base Reference Point Command (<ESC>A3) establishes the zero point of the Horizontal and Vertical axis so the distance may be calculated in dots from that point to the label's edge. This command immediately follows the Data Start Command.

Example: Label Width = total dots - = 406 dots
New Base Ref Point = Max Print Width - Label Width
= (dot quantity) - (406 dots) = 426 dots

Issue Base Reference Point command <ESC>A3 after the data Start command.

<ESC>A<ESC>A3H0426V0001. . . . . .

HORIZONTAL OFFSET COMMAND

Allows print image orientation by combining a part of both methods above by establishing the media size and then orienting it through base reference point adjustment.

Example: A Printer with 8-dpmm:
Label Width = 2" x 25.4 mm/in x 8 dpmm = 406 dots
New Base Reference Point = Maximum Print Width - Label Width
= (832 dots) - (406 dots) = 426 dots

Each <ESC>H command would have the value "426" added to it to correctly position each field.

NOTE: The <ESC>A3 Base Reference Point command can also shift the reference point in a negative direction (toward the outside edge of the label).

The Command Code subsection contains a sample label output for each command code. These samples reflect how the printed information would appear on a 4.25 inch wide label.

If you want to test any of the sample label outputs and are using labels less than five inches in width, it is recommended that the Base Reference Point command be added to the data stream to print the image onto the label.

The addition of the Base Reference Point command to the data stream will help adjust the print. See the following two examples or refer to the Base Reference Point command description.

Example:
<ESC>A
<ESC>H0050<ESC>V0100<ESC>L0303<ESC>XMSATO
<ESC>H0050<ESC>V0200<ESC>B103100*SATO*
<ESC>H0070<ESC>V0310<ESC>L0101<ESC>XUSATO
<ESC>Q1<ESC>Z

If using a 2 inch wide label, the entire image may not appear on the label. By adding the following Base Reference Point command to the second line of the data stream, the base reference point will be changed, causing the image to shift toward the inside of the printer where it can be printed on the narrower label.

Example: M8400RVe data stream results in a 2 inch wide label:
<ESC>A
<ESC>**A3H0406V0001**
<ESC>H0050<ESC>V0100<ESC>L0303<ESC>XMSATO
<ESC>H0050<ESC>V0200<ESC>B103100*SATO*
<ESC>H0170<ESC>V0310<ESC>L0101<ESC>XUSATO
<ESC>Q1
<ESC>Z

The image is moved horizontally to the right 2 inches (406 dots) so that itcan be printed on a 2 inch wide label. For more information, see the Base Reference Point command description.

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COMMAND QUICK REFERENCE

- **A through Z (all commands)**

COMMAND QUICK REFERENCE	
INSTRUCTION	**DESCRIPTION**
A	**Start Code**. Begins all print jobs
~Aaaaa	**Cut, Label.** Specifies the number of labels to print between each cut. It is independent of the Quantity command. aaaa = Number of labels between each cut
~aaaa	**Cut, Job.** Cuts labels at a specified interval in a print job. Quantity of labels printed is equal to the product of the quantity specified x the value of aaaa. aaaa = Number of labels between each cut (0001 to 9999)
~B	**Cut, Last.** Cuts any printed labels that remain in the printer.
AOa	**Auto Online.** Allows the automatic online on power up setting to be enabled or disabled. a = 0: Powers up in the online mode 1: Powers up in the offline mode
A1aaaabbbb	**Media Size.** Specifies the label size. aaaa = Label height in dots (0 to Vmax) bbbb = Label width in dots (0 to Hmax)
&	**Store Form Overlay**. Stores a specified label image in the printer's volatile form overlay memory.
AR	**Normal Print Length**. This command resets the printer to the Standard print length (7 inches).
&Raa	**Form Overlay, Recall.** Recalls a label image previously stored in Expanded Memory. aa = Storage number (00 to 99)
&S,aa,bbbb,cccc	**Form Overlay, Store.** Stores a label image in Expanded Memory. aa = Storage number (00 to 99) bbbb = Horizontal size of window to be stored (50 to Hmax) cccc = Vertical size of window to be stored (50 to Vmax)

COMMAND QUICK REFERENCE	
INSTRUCTION	**DESCRIPTION**
*a,bbb	**Clear Memory Card.** Stores a label image in Expanded Memory. a = Memory section to be cleared. G: SATO graphics file (001 to 999) P: PCX graphics file (001 to 999) F: Stored formats (001 to 999) O: TrueType fonts, memory card (001 to 009) R: BMP graphic file (001 to 999) bbb = BMP graphic file (001 to 999)
@,nn...n	**Offline/Pause.** Signals the printer to go offline after upon job completion. nn...n = Optional message to be displayed on the LCD (max 32 characters).
A3H-aaaa-Vbbbb	**Base Reference Point**. Establishes a new base reference point position for the current label. Units of measurement are dots. - = Optional character.If included, will shift reference point in negative direction. aaaa = Horizontal reference point bbbb = Vertical reference point
AX	**Print Area Enlargement.** This command sets the printer to the Expanded print length (14 inches). <ESC>EX0 is the recommended replacement.

COMMAND QUICK REFERENCE	
INSTRUCTION	**DESCRIPTION**
Babbcccd	**Bar Codes**. Prints a 1:3 ratio barcode. a = 0: Codabar 1: Code 39 2: Interleaved 2 of 5 (I 2/5) 3: UPC-A/EAN-13 4: EAN-8 5: Industrial 2 of 5 6: Matrix 2 of 5 7: reserved 8: reserved 9: reserved A: MSI B: reserved C: Code 93 D: reserved E: UPC-E F: Bookland G: Code 128 H: SSCC bb = Number of dots (01 to 12) for narrow bar and narrow space ccc = Bar height in dots (001 to 999) d = SSCC only 0: No human readable text 1: Human readable at top 2: Human readable at bottom
BC	**CODE 93 Barcode.** Prints a CODE 93 barcode. a = Narrow bar width (01 to 12 dots) b = Height of barcode (001 to 999 dots) c = Digit quantity of data (01 to 99) n = Print data
BDabbcccd	**Bar Codes**. Prints a 2:5 ratio barcode, except for UPC, EAN, Code 93, Code 128 and SSCC symbols, which are fixed width bar codes. For values a, bb, ccc and d see instructions for Babbcccd. For UPC/EAN bar codes, this command puts descender bars and humand readable text below the symbol.

COMMAND QUICK REFERENCE	
INSTRUCTION	**DESCRIPTION**
BF	**Bookland.** Prints a Bookland barcode. a = Narrow bar width (01 to 12 dots) b = Height of barcode (001 to 999 dots) n = Print data
BG	**CODE 128.** Prints a CODE 128 barcode. a = Narrow bar width (01 to 12 dots) b = Height of barcode (001 to 999 dots) n = Print data
BI	**SSCC.** Prints a SSCC barcode. a = Narrow bar width (01 to 12 dots) b = Barcode height (001 to 999 dots) c = Barcode expository font specification 0: Without HRI 1: HRI available in upper part of barcode 2: HRI available in upper part of barcode n = Barcode print data (17 digits fixed)
BJaa..abb..b	**True Type Font, Store.** Prepares the Expanded Memory to accept True Type font data. aa...a = 40 byte font description bb...b = 10 byte date field
BJDcccccddddee...e	**True Type Font, Download Bit Mapped Data.** Downloads the bit mapped TrueType font data to the memory area specified. ccccc = Memory Offset (hexadecimal) dddd = Data size in bytes (max = 2000) ee...e = Font data to be downloaded
BJFaaaaaaaa	**Card, Format.** Initializes the Memory Area and formats it for use. Should be preceded by the Memory Area Select command for the memory area to be initialized. aaaa....a = 8 character alphanumeric password
BJS	**Print Memory Card Status.** Reports the status of the currently active Memory Card to the host by printing a status label.

COMMAND QUICK REFERENCE	
INSTRUCTION	**DESCRIPTION**
BJTaabbccddeefffgg..g	**True Type Font, Recall.** Recalls a previously stored bit mapped TrueType font for use. aa = Font ID (01 to 99) bb = Horizontal Expansion (01 to 12) cc = Vertical Expansion (01 to 12) dd = Reserved, always 00 ee = Character pitch (01 to 99) ffff = Number of characters gg...g = Data to be printed using font
BKaabbcddeeefffnn...n	**PDF417.** Prints PDF417 2-D symbols. aa = Minimum module dimension (03-09 dots). Will not print for values of 01, 02 or greater than 09. bb = Minimum module pitch dimension (04-240 dots). Will not print for values of 01, 02, 03 or greater than 25. c = Security level (1-8). dd = Code words per line (01-30). If 00 is specified for dd and ee, printer will automatically optimize settings. ee = Rows/symbol (00 or 03). If 00 is specified for dd *and* ee, printer will automatically optimize settings. fff = Number of characters to be encoded (0001-2700) g = Not specified, standard PDF417 M: Micro PDF417 T: Truncated PDF417 nn...n = Data to be printed.
BPn...n	**Postnet**. Prints Postnet bar codes. n...n = 5 digit ZIP (Postnet-32 format) 6 digits (Postnet-37 format) 9 digit ZIP+4 (Postnet -52 format) 11 digit ZIP+4+DPC (Postnet-62, Delivery Point format).

COMMAND QUICK REFERENCE	
INSTRUCTION	**DESCRIPTION**
BQ	**QR Code.** Prints QR CODE of 2D code. a = Error correction level 1: 7% high density 2: 15% standard 3: 30% high reliability 4: 25% b = Concatenation mode 0: Normal Mode 1: Concatenation mode c = Size of one side of cell (01 to 32) d = Quantity of partitions by concatenation mode (01 to 16) e = Sequential number partitioned by concatenation (01 to 16) f = Concatenation mode parity data (00 to FF) g = Character mode 1: Number Mode 2: Alphanumeric Mode 3: Binary Mode h = Quantity of data (0001 to 7366) n = Print data.
BTabbccddee	**Bar Codes**. Variable Ratio. provides the ability to print a bar code with a ratio other than those specified through the standard bar code commands (B, BD, and D). a = Bar code option: 0: Codabar 1: Code 39 2: Interleaved 2 of 5 5: Industrial 2 of 5 6: Matrix 2 of 5 bb = Narrow space in dots (01-99) cc = Wide space in dots (01-99) dd = Narrow bar in dots (01-99) ee = Wide bar in dots (01-99)

COMMAND QUICK REFERENCE	
INSTRUCTION	**DESCRIPTION**
BVa,b,c, ddddddddd,eee, f f f,gg..g	**Maxicode**. Prints 2-D Maxicode symbols per AIM I.S.S. specification. a = Position of symbol within the set b = Total number of symbols in the set c = Mode dd..d = 9 digit numeric Postal Code eee = 3 digit numeric Country Code f f f = 3 digit numeric Service Class gg..g = Data, terminated by <ESC>
BWaabbb	**Bar Codes**. Expansion. Works together with the BT command to specify an expansion factor and the bar code height for the particular symbol being printed. aa = Expansion factor by which the width of all bars and spaces is increased (01 to 12) bbb = Bar height by dot (004 to 999 dots)
BXaabbccddeeefffghh	**Data Matrix**. Data Format. Specifies the format of the Data Matrix 2-D symbology. aa = Format ID (01 to 06, If ECC200 is selected (bb=20) this field is ignored. bb = Error correction level (00, 05, 08,10,14, 20 or 200. All other values processed as 00. cc = Horizontal cell size (03 to 12 dots/cell) dd = Vertical cell size (03 to 12 dots per cell) eee = Cells per line. Use 000 for optimized symbol. fff = Cell lines. Use 000 to optimize. g = Mirror image 0: Normal Print 1: Reverse Print hh = Guide cell thickness (01 to 15) 01 indicates normal type.
C	**Repeat Label**. Prints a duplicate of the last label printed.
CCa	**Card, Slot for Use.** Selects the memory area for all following expanded memory commands. a = Memory Area 1 b = Memory Area 2

COMMAND QUICK REFERENCE	
INSTRUCTION	**DESCRIPTION**
CLa	**CL/LF Deletion.** Deletes the occurrence of CR/LF characters in the data stream. a = 0: Do not delete CR/LF 1: Delete CR/LF
CSa	**Print Speed Selection**. Specifies a unique print speed in in./sec. through software for a particular label. a = Speed Range
Dabbcccn	**Barcode, Human Readable Information (HRI).** Specifies the character type of human readable information of barcode. a = 3: JAN/EAN13 4: JAN/EAN8 H: UPC-A b = Narrow bar width (01 to 12 dots) c = Barcode height (001 to 999 dots) n = Barcode print data
dn...n	**Barcode, Human Readable Information (HRI).** Specifies the character type of human readable information of barcode. May be used in conjunction with the preceding <ESC>D. d = Character type specification XU XS XM XB XL OA OB HRI data n = HRI print data
DCxx...x	**Data Matrix**. Print Data. Prints data using Data Matrix format specified in BX Data Format command. xx...x = Data to be printed. Cannot exceed 500 characters.

COMMAND QUICK REFERENCE	
INSTRUCTION	**DESCRIPTION**
$	**Font, Vector. Specifies printing of the unique SATO vector font.** a = A: Helvetica Bold (proportional spacing) B: Helvetica Bold (fixed spacing) b = Font width (50 to 999 dots) c = Font height (50 to 999 dots) d = Font variation (0 to 9) as follows: 0: Standard 1: Standard open (outlined) 2: Gray (mesh) pattern 1 3: Gray (mesh) pattern 2 4: Gray (mesh) pattern 3 5: Standard, shadow 1 6: Standard, shadow 2 7: Standard mirror image 8: Italic 9: Italic open (outlined)
$=	**Outline Font Print.** Specifies the print of outline font. n = Print data
Eaaa	**Line Feed**. Provides the ability to print multiple lines of the same character size without specifying a new print position for each line. aaa = Number of dots (1 to 999) between the bottom of the characters on one line to the top of the characters on the next line.
EP	**Print End Position.** Specifies the label stop position in the sensor valid mode.
EU	**EAN/UCC Composite Symbol**. Specifies the composite symbol of EAN/UCC.
EX0	**Expanded Print Length**. Expands the print length to 9999 dots.
Faaaabcccc ddee	**Sequential Numbering**. Allows the printing of sequencing fields (text, bar codes) where all incrementing is done within the printer. aaaa = Number of times to repeat the same data (0001 to 9999). b = Plus or minus symbol (+ for increments; - for decrements). cccc = Value of step for sequence (001 to 9999). dd = Quantity of digits for sequential numbering (01 to 99). ee = Quantity of digits free for sequential numbering (01 to 99).

COMMAND QUICK REFERENCE	
INSTRUCTION	**DESCRIPTION**
FC	**Print, Circles.** Specifies the printing of circles. a = Radius (5 to 999 dots) b = Line width (1 to 999 dots) c = Sectional number (0 to 8 dots) d = Pattern (0to 3) 0: Solid black line 1: Gray 1 2: Gray 2 3: Gray 3
FM	**Memory Cartridge Format.** Formats the memory cartridge. Up to 8 bytes of alphanumeric and symbol (omissible)
FP	**Memory Cartridge Printing.** Printing the memory cartridge. It will be printed by width 100mm and pitch 100mm.
FT	**Print, Triangles.** a = Side length (10 to 2000 dots) b = Line width (01 to 1000 dots) c = Base length (10 to 2000 dots) d = Pattern (0 to 3) 0: Solid black line 1: Gray 1 2: Gray 2 3: Gray 3
FWaabcccc	**Line**. Prints a line. Units of measurement are dots. aa = Width of line b = V: Vertical line H: Horizontal line cccc = Length of line
FWaabbVcccHdddd	**Box**. Prints a box. For values aa, bbbb, cc, and dddd, see instructions for horizontal and vertical lines. Units of measurement are dots. aa = Width of horizontal side bb = Width of vertical side cccc = Length of vertical side dddd = Length of horizontal side

COMMAND QUICK REFERENCE	
INSTRUCTION	**DESCRIPTION**
FXaaabcccdddeee	**Data Matrix**. Sequential Numbering. Prints sequential numbered Data Matrix 2-D symbols. aaa = Number of duplicate labels (001 to 999) b = Increment or decrement +: Increment -: Decrement ccc = Increment/decrement steps (001 to 999) ddd = Sequential numbering start position (001 to 999) from left side. eee = Incremented data length (001 to 999). Measured from start position.
Gabbbccc(data)	**Custom Graphics**. Allows the creation and printing of graphic images using a dot-addressable matrix. a = Specifies format of data stream to follow B: Binary H: Hexadecimal bbb = Number of horizontal 8 x 8 blocks ccc = Number of vertical 8 x 8 blocks data = Data to describe the graphic image
GCaaa	**BMP File, Recall.** Recalls BMP graphic files stored in Expanded Memory.
Glabbbcccdddee...e	**Graphic, Store.** Stores a graphic image in the memory card to be called later for printing on a label. a = Specifies format of data stream to follow B: Binary H: Hexadecimal bbb = Number of horizontal 8 x 8 blocks ccc = Number of vertical 8 x 8 blocks ddd = Graphics storage number (001 to 999) ee...e = Data to describe the graphic image
GMaaaaa	**BMP File**. Downloads BMP file to the internal graphics image memory. aaaaa = Quantity of bytes to download (max DOS file size is 32K).
GPaaaaa	**PCX File**. Downloads PCX file to the internal graphics image memory. aaaaa = Quantity of bytes to download (max DOS file size is 32K).

COMMAND QUICK REFERENCE	
INSTRUCTION	**DESCRIPTION**
GRccc	**Graphic, Recall.** Recalls for printing the graphic image stored by the GI command. ccc = Storage number (001 to 999)
GTaaa,bbbbb, nn. . . n	**BMP File, Store.** Stores BMP files in Expanded Memory. aaa = Storage area number (001 to 999) bbbbb = Size of BMP file in bytes nn....n = Data
Haaaa	**Horizontal Position**. Specifies a field's horizontal location across the width of the label from the current base reference point. The units of measurement are dots.
IDaa	**Job ID Store**. Stores the Job ID number. aa = Job ID number assigned (01 to 99)
J	**Journal Print**. Provides the ability to print text line by line. Fixed spacing between lines and characters.
Kab90cc	**Custom Designed Characters, Recall**. Recalls for printing a custom character stored by the Tabcc(data) command. a = 1: 16 x 16 matrix 2: 24 x 24 matrix b = Indicates the format that data stream was stored B: Binary H: Hexadecimal cc = Memory location where the character was stored. Valid locations are 21 to 52 or "!" to "R" in hex values.
Laabb	**Character, Expansion**. Expands characters in both directions. aa = Multiple to expand horizontally (01 to 12) bb = Multiple to expand vertically (01 to 12)
LAa	**Language.** Specifies the display language for the LCD. a = 0: English 1: French 2: German 3: Spanish 4: Italian 5: Portugese 6: Extensible language (Japanese, etc)

COMMAND QUICK REFERENCE	
INSTRUCTION	**DESCRIPTION**
LDa,b,c,d,e,f,g,i,jj	**User Download.** Downloads a user defined set of Alternate Protocol Command Codes. See Appendix E for details on the proper usage of this command.
LFa	**Online Feed.** To enable or disable online label feed. a = 0: Enables label feed when online 1: Disables label feed when online
LHa	**Zero Slash.** Allows printing zeroes with or without a slash. a = 0: Prints zeroes without a slash 1: Prints zeroes with a slash
M	**Font type**. Specifies the 13W x 20H dot matrix font (includes descenders).
NC	**Cutting Operation**. Specifies the movement of cutting.
OA	**Font type**. Specifies the OCR-A font.
OB	**Font type**. Specifies the OCR-B font dot matrix.
OL	**Online.** Changes the printer status from offline to online.
Paa	**Character Pitch**. Designates the number of dots between characters. aa = Number of dots between characters (01 to 99)
(aaaa,bbbb	**Reverse Image.** Reverse image from black to white and vice versa. The units of measure are dots. aaaa = Horizontal length in dots of area to be reversed. bbbb = Vertical height in dots of area to be reversed.
PCaa,bbPCF,a,.....z	**Flash ROM Setup.** Sets the default printer configuration in Flash ROM.
#Ea	**Print Darkness.** Specifies a new print darkness setting.
%a	**Rotate, Fixed Base Reference Point.** a = 0: Sets print to normal direction. 1: Sets print to 90 degrees counter-clockwise. 2: Sets print to 180 degrees rotated (upside down) 3: Sets print to 270 degrees counter-clockwise (90x CW).
PG	**EEPROM Setup.** Sets the default printer configuration in EEPROM.
PIaaa,bbbbb,cc...c	**PCX File, Store.** Stores a PCX graphic file. aaa = Storage number (001 to 999) bbbbb = Number of bytes in the file to be stored. cc...c =
PR	**Fixed Font Spacing**. Returns the printer to fixed character spacing mode.

COMMAND QUICK REFERENCE	
INSTRUCTION	**DESCRIPTION**
PS	**Proportional Font Spacing**. Places the printer in the proportional character spacing mode. Will not work with U Font.
PYaaa	**PCX File, Recall.** Recalls a PCX graphics file. aaa = The storage number assigned to the file (001 to 999)
Qaaaaaa	**Print Quantity**. Specifies the total number of labels to print. aaaaaa = Total quantity of labels to print for the job (000001-999999)
RDabb,ccc,ddd,nn...n	**Font Type**. Specifies the internal AGFA raster fonts. a = F: Specifies Futura font P: Specifies CG Palcio font S: CG Century Schoolbook font G: CG Triumvirate Condenced font V: CG Univers font t: CG Times font bb = 0: No character set 1: ISO 8859/1 Latin1 2: ISO 8859/2 Latin2 3: ISO 8859/9 Latin5 4: CP-737 DOSGreek 5: CP-885 DOS Cirillic 6: CP-864 DOSArabic 8: PC-850 Multilingal ccc = Horizontal Size (16 to 999 dots or P08 to P72 point size) ddd = Vertical Size (16 to 999 dots or P08 to P72 point size) nn..n = Data to be printed
RF	**Recall and Print of Font & Logo.** Calls and prints font and logo downloaded with Label Gallery's "GalleryMemMaster". a = Font ID number (01 to 99) b = Print digit (1 to 9999) n = Print data
RMaaaa,bbbb	**Mirror Image**. Prints mirror image of data. Must be preceded by an <ESC>A1 Media Size command.
S	**Font type**. Specifies the 8W x 15H dot matrix font (includes descenders).
/	**Form Overlay, Recall.** Recalls the label image from the printer's form overlay memory for printing.

COMMAND QUICK REFERENCE	
INSTRUCTION	**DESCRIPTION**
/D	**Field, Recall.** To recall a field previously stored in in the memory card. bb = Quantity of fields to be recalled (01 to 99). cc...c = Data to be placed in field.
/N	**Field, Store.** To store a field in the memory card. bb = Field number (01 to 99). cc = Quantity of characters in the field.
Tabcc(data)	**Store Custom Designed Characters**. To create and store custom characters or images in the printer's volatile memory. See Kab90cc to recall the character for printing. a = 1: 16 x 16 matrix 2: 24 x 24 matrix b = Specifies data stream format to follow B: Binary H: Hexadecimal cc = Memory location to store the character. Valid locations are 21 to 52 or "!" to "R" in hex values. (data) = Data to describe the character.
U	**Font type**. Specifies a 5W x 9L dot matrix font (includes descenders).
Vbbbb	**Vertical Position**. Specifies a field's vertical location down the length of the label from the current base reference point. Units of measurement are dots.
WA (elements)	**Calendar Print.** Prints the date and/or time field (up to 16 characters) from the printer's internal clock. Use slash to separate date elements and colon to separate time elements. The calendar feature is a purchase option and will only be applicable to those printers so ordered. Elements = YY: 2 digit Year (00 to 99) YYYY: 4 digit Year (1981 to 2080) MM: Month (01 to 12) DD: Day (01 to 31) HH: 12 Hour (00 to 11) hh: 24 Hour Clock (00 to 23) mm: Minutes (00 to 59) ss: Seconds (00 to 59) TT: AM or PM JJJ: Julian Date (000 to 366) WW: Week (00 to 53) ww: Week (01 to 54)

COMMAND QUICK REFERENCE	
INSTRUCTION	**DESCRIPTION**
WB	**Font Type**. Specifies the 18W x 30L dot matrix font (includes descenders). a = 0: Disables auto-smoothing of font 1: Enables auto-smoothing if expansion is greater than 3
WDHaaaaVbbbbXccccYdddd	**Copy Image Area (Partial Copy)**. To copy an image to another location of the label. aaaa = Horizontal position of the top left corner of image area bbbb = Vertical position of the top left corner of image area cccc = Horizontal length of image area dddd = Vertical length of image area
WKnn...n	**Job Name**. Stores the job name. nn..n = Job name, up to 16 ASCII characters
WLa	**Font type**. Specifies the 28W x 52L dot matrix font (including decenders). a = 0: Disables auto-smoothing of font 1: Enables auto-smoothing if expansion is greater than 3
WPabbb	**Calendar Increment.** To add a value to the printer's current date and/or time. Does not change the printerís internal time setting. The calendar feature is a purchase option and will only be applicable to those printers so ordered. a = Y: Years M: Months D: Days h: Hours bbb = Numeric data, Week (00-99), Years (1-9), Months (01-99), Days (001-999), Hours (001-999).
WTaabbccddee	**Calendar Set.** To set the time and date of the printer's internal clock. aa = Year (00-99) bb = Month (01-12) cc = Day (01-31) dd = Hour (00-23) ee = Minute (00-59)
XBa	**Font Type.** Specifies 48W x 48L dot matrix font (includes descenders). a = 0: Disables auto-smoothing of font 1: Enables auto-smoothing if expansion is greater than 3. n = Print data

COMMAND QUICK REFERENCE	
INSTRUCTION	**DESCRIPTION**
XL	**Font Type.** Specifies the 48W x 48H dot matrix font (includes descenders). a = Smoothing specification 0: Smoothing disabled 1: Smoothing enabled n = Print data
XM	**Font type**. Specifies the 24W x 24H dot matrix font (includes descenders).
XS	**Font type**. Specifies the 17W x 17H dot matrix font (includes descenders).
XU	**Font type**. Specifies the 5W x 9L dot matrix font (includes descenders).
YR,aaa/D,bb,cc...c	**Recall Format/Field**. To recall a field from a format previously stored in the memory card. aaa = Number of format to be recalled (001 to 999) bb = Number of field to be recalled (01-99) cc...c = Data to be placed in field.
YS,aaa/Nbb,cc	**Store Format/Field**. To store a field in a format in the memory card. aaa = Format number (001 -999) bb = Field number (01-99) cc = Number of characters in the field
Z	**Stop Code**. Ends all print jobs.
0 (zero)	**Replace Data (Partial Edit)**. Provides the ability to replace a specified area of the previous label with new data.

4

STANDARD COMMAND CODES

- Control Commands
- Modification Commands
- Print Position Commands
- Font Commands
- Barcode Commands
- 2D Code Commands
- System Commands
- Graphic Commands

CONTROL COMMANDS

START/STOP LABEL	
FUNCTION	For all print jobs, the Start command must precede the data and the Stop command must follow. The print job will not run properly if these are not in place.
FORMAT	Start Command: <ESC>**A** Stop Command: <ESC>**Z** <ESC>A must precede data <ESC>Z must follow data.
EXAMPLE	<ESC>**A** <ESC>H0001<ESC>V0100<ESC>WB1SATO <ESC>H0130<ESC>V0200<ESC>B103150*SATO* <ESC>H0170<ESC>V0360<ESC>L0202<ESC>S*SATO* <ESC>Q1 <ESC>**Z**
OUTPUT	This command does not result in printer output.
NOTES	There is no output for these commands they are not accompanied by other label printing commands. However, these commands must precede and follow each print job sent to the printer.

PRINT QUANTITY	
FUNCTION	To specify the total quantity of labels to print for a given print job.
FORMAT	<ESC>**Qaaaaaa** aaaaaa = Total number of labels to print (1 to 999999) Place just preceding <ESC>Z, unless <ESC>~ exists, then preceding that. This command must be present in every print job.
EXAMPLE	<ESC>A <ESC>H0100<ESC>V0100<ESC>WB1SATO <ESC>**Q3** <ESC>Z
OUTPUT	Three labels containing the data “SATO” will be printed.
NOTES	To cancel a print job, turn off the printer or send the <ESC>CAN code if using the Bi-Com mode. Multi-Buffer jobs can be cleared with the Clear Print Job (<ESC>*) and Memory command. When used with the Sequential Numbering (<ESC>F) command, the Print Quantity value should be equal to the total number of labels to be printed. If a Print Quantity is not specified, the printer will not print a label. For this command, leading zeroes do not have to be entered. The command “Q1” is equivalent to “Q000001”.

JOB ID, STORE	
FUNCTION	To add an identification number to a job. The status of the job can then be determined using the ENQ command in the Bi-Com status mode.
FORMAT	<ESC>**IDaa** aa = Job ID assigned (01 to 99) Place immediately following the <ESC>A in the job data stream.
EXAMPLE	<ESC>A <ESC>**ID02** . . . Job . . . <ESC>Z
OUTPUT	This command does not result in printer output.
NOTES	Works only in Bi-Communications modes. The Job ID number must be stored before Bi-Com status mode can be used. If more than one ID number is sent in a single job, i.e. <ESC>A <ESC>ID01 . . . . . . <ESC>ID02 . . . . . . The last number transmitted will be used.

JOB NAME	
FUNCTION	This command is to identify a particular job using a descriptive name.
FORMAT	<ESC>**WKnnn. . . n** nn..n = Job Name assigned, up to 16 ASCII characters Place immediately following the <ESC>A in the job data stream.
EXAMPLE	<ESC>A <ESC>**WKSATO** . . . Job . . . <ESC>Z
OUTPUT	This command does not result in printer output. The information is returned to the host upon receipt of a Bi-Com status request.
NOTES	Works only in Bi-Com 4 mode. The Job Name must be stored before Bi-Com status mode can be used. If more than one Job Name is sent in a single job, i.e. <ESC>A <ESC>WKSATO . . . . . . <ESC>WKSATO AMERICA . . . . . . The last name transmitted will be used.

MODIFICATION COMMANDS

CHARACTER, EXPANSION

FUNCTION	To independently expand characters in both the horizontal and vertical directions. The command allows enlargement of the base size of each font (except the vector font) up to 12 times in either direction.
FORMAT	<ESC>**Laabb** aa = Multiple to expand horizontally (01 to 12) bb = Multiple to expand vertically (01 to 12) Place preceding the data to be expanded.
EXAMPLE	<ESC>A<ESC>H0100<ESC>V0100<ESC>XMSATO <ESC>H0100<ESC>V0200<ESC>**L0402**<ESC>XMSATO <ESC>H0100<ESC>V0300<ESC>**L0204**<ESC>XMSATO <ESC>Q1 <ESC>Z
OUTPUT	(4-1)
NOTES	Expanded characters are typically used with this command for added emphasis or for long distance readability. This command will expand the following fonts: Fonts U, S, M, XU, XS, XM, OA & OB and fonts WB, WL, XB and XL. This command will also affect the following commands: Character Pitch Characters, Custom-Designed The Character Expansion value is in effect for the current print job until a new expansion command is specified. The Line and Box command, if used within the data stream, may return all subsequent text to the default expansion of 1 x 1. Therefore, either send the Character Expansion command before all printed data, or send Line and Box commands last, preceding the Quantity (<ESC>Q) command. **Refer to Appendix: Reference Table 1 for additional information.**

CHARACTER, PITCH

FUNCTION	To designate the amount of spacing (in dots) between characters. This command provides a means of altering character spacing for label constraints or to enhance readability.
FORMAT	<ESC>**Paa** aa = Number of dots between characters (00 to 99) Place preceding the text to be printed.
EXAMPLE	<ESC>A <ESC>H0025<ESC>V0025<ESC>L0202<ESC>XB1SATO <ESC>H0025<ESC>V0125<ESC>L0202<ESC>**P20**<ESC>XB1SATO <ESC>H0025<ESC>V0225<ESC>L0202<ESC>**P40**<ESC>XB1SATO <ESC>Q1 <ESC>Z
OUTPUT	(4-2)
NOTES	This command is affected by the <ESC>L Character Expansion command. The character pitch is actually the product of the current horizontal expansion multiple and the designated pitch value. Example: <ESC>L0304 <ESC>P03 Pitch = (03) x (03) = 9 dots To avoid confusion, you may want to include the <ESC>L Character Expansion command and this command together in your program. This command affects fonts U, S, M, XU, XS, XM, OA & OB, WB, WL, XB and XL, and the vector font. Character Pitch will always revert to the default value unless it is specified before each new font command in the data stream. This command also affects Codabar, Code 39 and Industrial 2 of 5 bar codes. **Refer to Appendix: Reference Table 2 for additional information.**

CHARACTER, FIXED SPACING

FUNCTION	To reset proportional spacing and place the printer back to fixed spacing.
FORMAT	<ESC>**PR** Place preceding the fixed space data.
EXAMPLE	<ESC>A <ESC>H0100<ESC>V0050<ESC>PS <ESC>L0202<ESC>XMPROPORTIONAL SPACING <ESC>H0100<ESC>V0180<ESC>**PR** <ESC>L0202<ESC>XMFIXED SPACING <ESC>Q1 <ESC>Z
OUTPUT	(4-3)
NOTES	This command only works with proportionally spaced fonts: XU, XM, XS, XL and XB. **Refer to Appendix: Reference Table 3 for additional information.**

CHARACTER, PROPORTIONAL SPACING

FUNCTION	To specify the printing of proportional or fixed spacing for proportionally spaced fonts.
FORMAT	<ESC>**PS** Set to proportional spacing Reset to fixed spacing. Place preceding the data to be proportionally spaced.
EXAMPLE	<ESC>A <ESC>H0025<ESC>V0050<ESC>**PS** <ESC>L0202<ESC>XMPROPORTIONAL SPACING <ESC>Q1 <ESC>Z
OUTPUT	(4-4)
NOTES	Once this command is sent in the data stream, it is in effect until the end of the print job unless a reset command is sent. **Refer to Appendix: Reference Table 4 for additional information.**

ROTATE, FIXED BASE REFERENCE POINT

FUNCTION

To rotate the print direction in 90° increments without changing the location of the base reference point. The diagram below illustrates the use of the Rotate (<ESC>%) command. Note that the entire print area is shown, but your label will probably not be as large as the entire area.

FORMAT

<ESC>**%a**

a = 0: Sets print to normal direction
1: Sets print to 90°CCW
2: Sets print to 180° rotated (upside down)
3: Sets print to 270° CCW

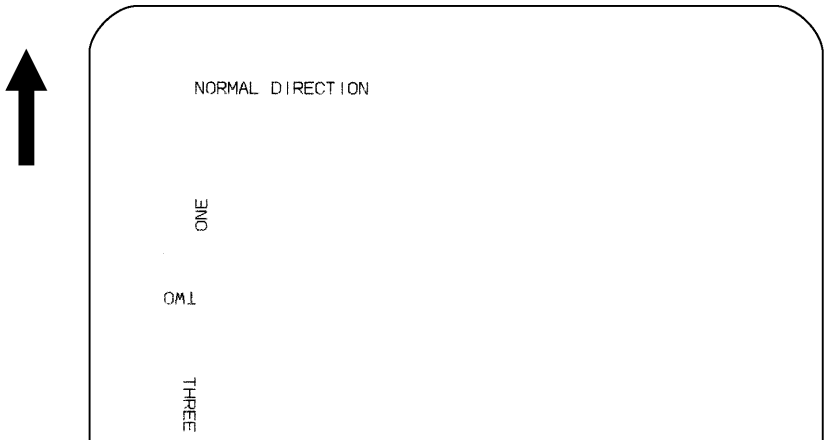
Place preceding any printed data to be rotated.

EXAMPLE

<ESC>A
<ESC>**%0**<ESC>L0202<ESC>H0200<ESC>V0100<ESC>MNORMAL DIRECTION
<ESC>**%1**<ESC>H0200<ESC>V0300<ESC>MONE
<ESC>**%2**<ESC>H0200<ESC>V0400<ESC>MTWO
<ESC>**%3**<ESC H0200<ESC>V0500<ESC>MTHREE
<ESC>Q1
<ESC>Z

OUTPUT

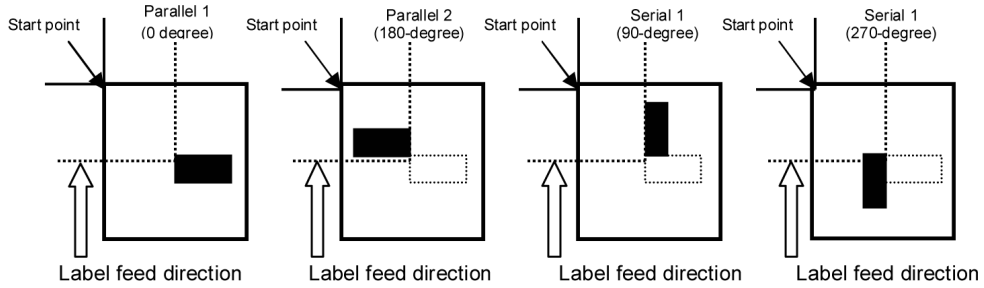
(4-5a)



NOTES

The specified values are valid until another Rotate (<ESC>%) command is received. Receipt of a Stop Print (<ESC>Z) command will reset the setting to the default value.

(4-5b)



Refer to Appendix: Reference Table 5 for additional information.

SEQUENTIAL NUMBERING

FUNCTION

To print sequential fields (text, bar codes) where all incrementing is done within the printer. Up to eight different sequential fields can be specified per label. Sequencing is effective for up to 99-digit numeric data within each field.

FORMAT

<ESC>**Faaaabcccc,dd,ee,g**

aaaa = Number of times to repeat the same data (0001 to 9999)

b = Plus or minus symbol (+ for increments; - for decrements)

cccc = Value of step for sequence (0001 to 9999)

dd = Sequential numbering digit quantity (01 to 99). The first character starts after those exempted in ee. If digits are omitted, 8 is default

ee = Number of digits free from sequential numbering (0 to 99) starting with the right most position. If digits are left out, the default is 0.

g = Count base 1 Decimal Count 2 Hexadecimal Base

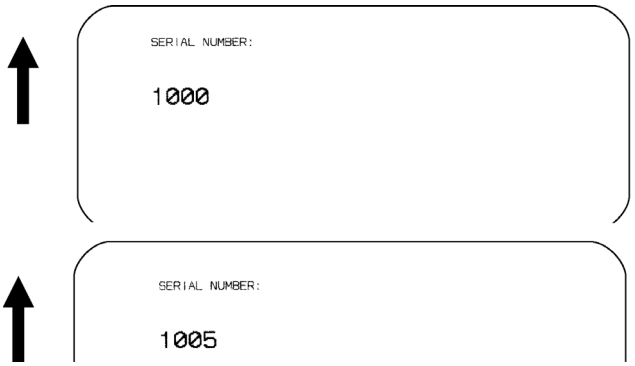
Place preceding the starting value to be incremented or decremented.

EXAMPLE

<ESC>A<ESC>H0100<ESC>V0100<ESC>MSERIAL NUMBER:
<ESC>H0100<ESC>V0200
<ESC>**F001+005**
<ESC>L0202<ESC>M1000<ESC>Q2<ESC>Z1

OUTPUT

(4-6a)

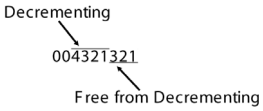


NOTES

The value specified for Print Quantity should be equal to the number of different sequential values desired multiplied by the number of repeats specified. Example: To print 2 sets each of numbers 1001-1025 on separate labels, we need 50 total labels.

<ESC>A
<ESC>H0100<ESC>V0100<ESC>F002+001<ESC>XM1001<ESC>Q50<ESC>Z

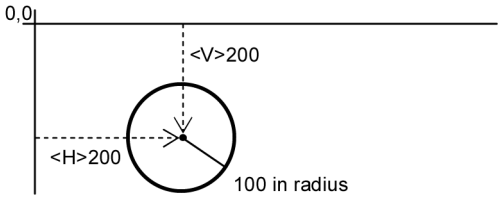
(4-6b)



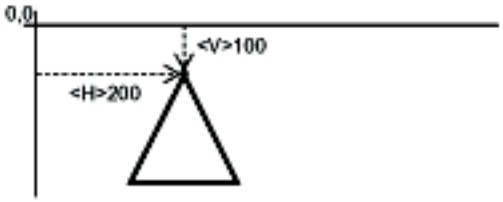
It is necessary to specify the print position for each sequential field on a label. Up to eight different sequential fields can be specified per label. Alpha characters are ignore

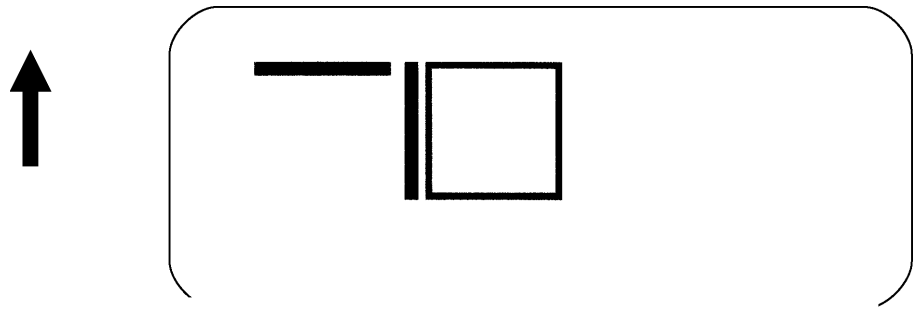
Refer to Appendix: Reference Table 6 for additional information.

PRINT, CIRCLES

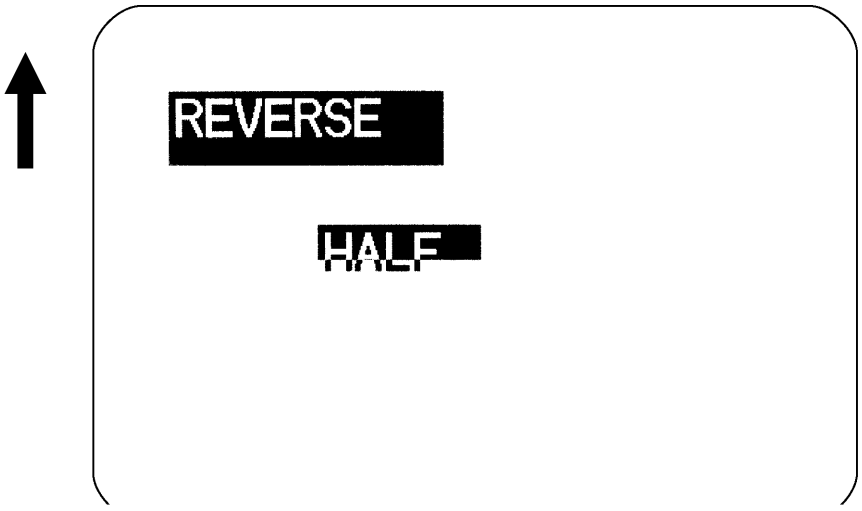
FUNCTION	Specifies the printing of circles.
FORMAT	<ESC>**FC** a = Radius (5 to 999 dots) b = Line width (1 to 999 dots) c = Section number (0 to 8) d = Pattern (0 to 3) 0: Solid black line 1: Gray 1 2: Gray 2 3: Gray 3 Place anywhere within the data stream.
EXAMPLE	<ESC>A <ESC>H0200<ESC>V0200<ESC>**FC,100, 8, 0, 0** <ESC>Q1 <ESC>Z
OUTPUT	This command sets the base reference point to the center of a circle and can be registered to the format. (4-7a) 
NOTES	When a sectional number value outside of the range is specified, it will be processed as “0” and will not be a command error. When the pattern designation value is outside the range is specified, it will be processed as “0” and also will not be a command error. When the print start position is outside of the printable area, printing will not be performed due to command error. (4-7b)

PRINT, TRIANGLES

FUNCTION	Specifies the printing of triangles.
FORMAT	<ESC>**FT** a = Side length (10 to 2000 dots) b = Line width (1 to 1000 dots) c = Base length (10 to 2000) d = Pattern (0 to 3) 0: Solid black line 1: Gray 1 2: Gray 2 3: Gray 3 Place anywhere within the data stream.
EXAMPLE	<ESC>A <ESC>H0200<ESC>V0100<ESC>**FT,100,8,100,0** <ESC>Q1 <ESC>Z
OUTPUT	This command sets the base reference point to the apex of the triangle and can be registered to the format. (4-8) 
NOTES	This command is only enabled while online. The value for the base length can be omitted and its value will be equal to the length of sides. The key buffer size is 1KB. One key entry information requires 2 bytes and up to 512 information entries are available. The key buffer acts as ring buffer. When the key entry exceeds the maximum entry capacity, the oldest entry information will be overwritten. When the exclusive use of key is initiated, the key buffer is initialized and vice-versa when it is terminated. As a result, key entry information is obtainable following this operation. Label printing or label error detection will be performed as usual even when the exclusive use of key is activated. Error occurrence while the exclusive use of key is activated will release the exclusive state. After recovering from the error and going back online, the exclusive use of key will be active again. Exclusive use of key is initially off when powering on the printer. Key Entry <IZ> is invalid when the exclusive use of key is activated.

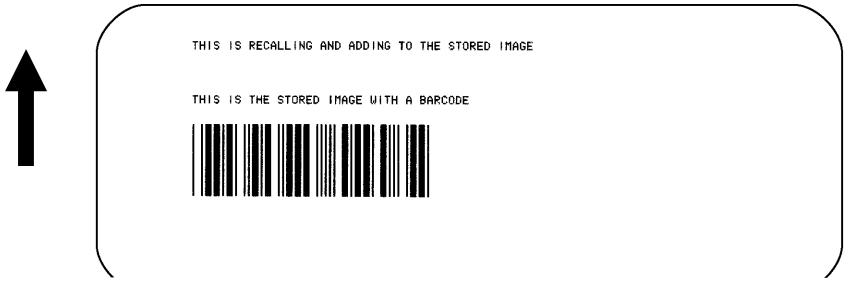
PRINT, LINES & BOXES	
FUNCTION	To print horizontal lines, vertical lines, and boxes as images on the label.
FORMAT	Line: <ESC>**FWaabcccc** aa = Width of horizontal line in dots (01 to 99) b = Line orientation H Horizontal line V Vertical Line cccc = Length of line in dots Box: <ESC>**FWaabbVccccHdddd** aa = Width of horizontal side in dots (01 to 99) bb = Width of vertical side in dots (01 to 99) cccc = Length of vertical side in dots dddd = Length of horizontal side in dots Place following the necessary positioning commands.
EXAMPLE	<ESC>A <ESC>H0100<ESC>V0100<ESC>**FW20H0200** <ESC>H0320<ESC>V0100<ESC>**FW20V0200** <ESC>H0350<ESC>V0100<ESC>**FW1010H0200V0200** <ESC>Q1 <ESC>Z
OUTPUT	(4-9) 
NOTES	It is recommended that all lines and boxes be specified in the normal print direction. Use the <ESC>EX0 Expanded Print Length command for maximum label length.

REVERSE IMAGE

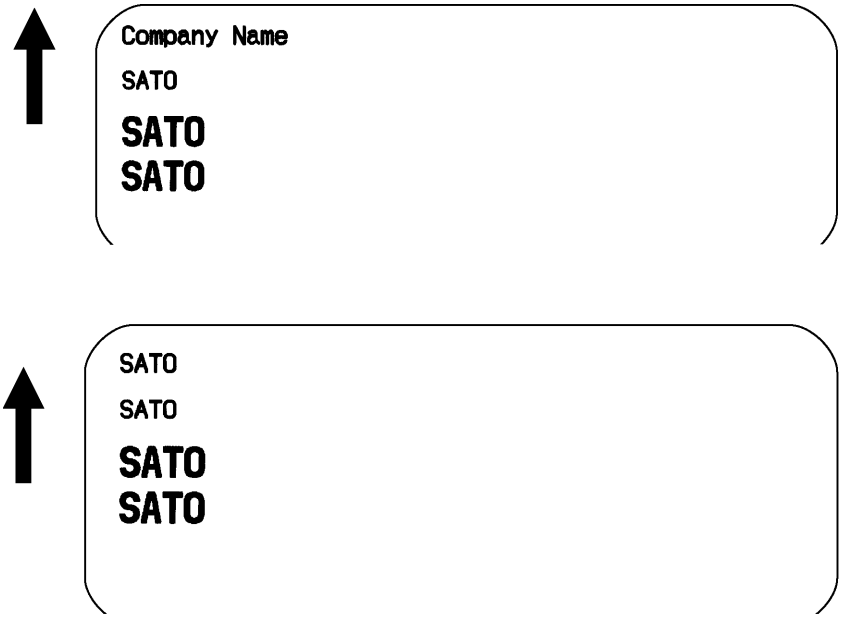
FUNCTION	To reverse an image area from black to white and vice versa. Use the Print Position commands (<ESC>H and <ESC>V) to locate the top left corner of the reverse image area.
FORMAT	<ESC>**(aaaa,bbbb** a = Horizontal length in dots of reverse image area b = Vertical height in dots of reverse image area. Must be preceded by all other data and be placed just before <ESC>Q.
EXAMPLE	<ESC>A <ESC>H0050<ESC>V0120<ESC>L0202<ESC>WB1REVERSE <ESC>H0250<ESC>V0300<ES C>L0202<ESC>WB1HALF <ESC>H0040<ESC>V0110<ESC>**(370,100** <ESC>H0240<ESC>V0290<ESC>**(220,47** <ESC>Q1 <ESC>Z
OUTPUT	(4-10) 
NOTES	A reverse image area is affected by the rotate commands. Therefore, always assume the printer is in the normal print orientation when designing and sending the Reverse Image command. If using reverse images with the form overlay, place this command before the Form Overlay command in the data stream. If the height and width to be reversed contains anything other than alphanumeric data, the area is not printed. If the values specified exceed the maximum ranges, the reverse image is not created.

FORM OVERLAY, STORE	
FUNCTION	To store a label image in the volatile form overlay memory. Only one label image may be stored in this memory area at a time.
FORMAT	<ESC>**&** Must be preceded by all other data and placed just before Stop (<ESC>Z) command.
EXAMPLE	<ESC>A <ESC>H0100<ESC>V0125 <ESC>STHIS IS THE STORED IMAGE WITH A BARCODE <ESC>H0100<ESC>V0165<ESC>B103100*12345* <ESC>**&** <ESC>Z
OUTPUT	This command does not result in printer output. It stores the label image in the overlay buffer.
NOTES	Remember that this storage is volatile. Therefore, if the printer loses power, the overlay must be sent again. The overlay is recalled using the Form Overlay Recall (<ESC>/) command. Form overlays do not have to be recompiled each time they are called to be printed and therefore may result in much faster print output. **Refer to Appendix: Reference Table 7 for additional information.**

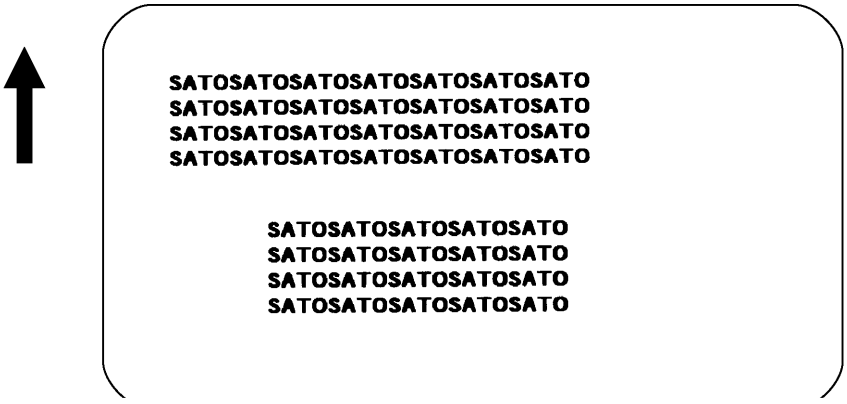
FORM OVERLAY, RECALL

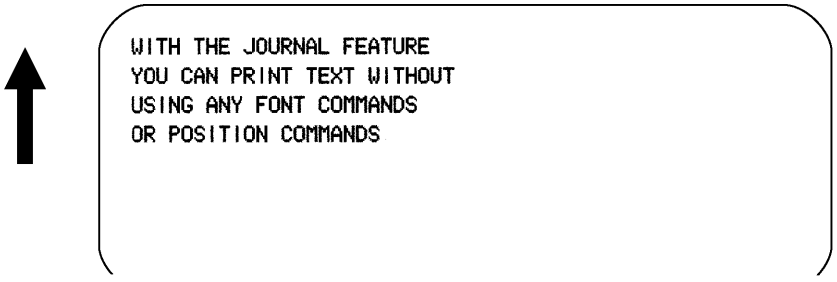
FUNCTION	To recall the label image from the form overlay memory for printing. Additional or different data can be printed with the recalled image.
FORMAT	<ESC>**/** Must be preceded by all other data and placed just before Print Quantity (<ESC>Q) command.
EXAMPLE	<ESC>A <ESC>H01000<ESC>V0125 <ESC>STHIS IS THE STORED IMAGE WITH A BARCODE <ESC>H0100<ESC>V0165<ESC>B103100*12345* <ESC>**&**<ESC>Z <ESC>A<ESC>H0100<ESC>V0050 <ESC>S**THIS IS RECALLING AND ADDING TO THE STORED IMAGE<ESC>/** <ESC>Q1 <ESC>Z
OUTPUT	(4-11) 
NOTES	The overlay is stored using the Form Overlay Store (<ESC>&) command. If this command is used with the Expanded Print Length (<ESC>EX0) command the Form Overlay length cannot exceed 9999 dots. **Refer to Appendix: Reference Table 8 for additional information.**

REPLACE DATA (PARTIAL EDIT)

FUNCTION	To replace a specified area of the previous label with new data. This command will cause the previous label to print along with any changes specified within the current data stream.
FORMAT	<ESC>0 (<ESC>zero) Must follow <ESC>A and precede all other print data
EXAMPLE	<ESC>A <ESC>H0025<ESC>V0020<ESC>WB0Company Name <ESC>H0025<ESC>V0085<ESC>WB1SATO <ESC>H0025<ESC>V0150<ESC>WL0SATO <ESC>H0025<ESC>V0215<ESC>WL1SATO <ESC>Q1<ESC>Z <ESC>A <ESC>**0**<ESC>H0025<ESC>V0020<ESC>WB0SATO <ESC>Q1 <ESC>Z
OUTPUT	(4-12) 
NOTES	Specify the exact same parameters for the image to be replaced as were specified in the original data stream; including rotation, expansion, pitch, etc. This will ensure the new data will exactly replace the old image. If the replacement data contains fewer characters than the old data, then the characters not replaced will still be printed. This command will not function if the power has been cycled off and back on since the last label was printed. Proportional Pitch text cannot be used with this command.

COPY IMAGE AREA (PARTIAL COPY)

FUNCTION	To copy an image from one location to another on the same label. This may be useful for duplicating individual fields or entire sections of the label with only one command.
FORMAT	<ESC>**WDHaaaaVbbbbXccccYdddd** aaaa = Horizontal position of the top left corner of the area bbbb = Vertical position of the top left corner of the area cccc = Horizontal length of the image area to be copied dddd = Vertical length of the image area to be copied Place anywhere within the data stream after specifying the location of the duplicate image.
EXAMPLE	<ESC>A <ESC>H0050<ESC>V0050<ESC>E010<ESC>XM SATOSATOSATOSATOSATOSATOSATO SATOSATOSATOSATOSATOSATOSATO SATOSATOSATOSATOSATOSATOSATO SATOSATOSATOSATOSATOSATOSATO <ESC>H0180<ESC>V0250<ESC>**WDH0130V0050X0400Y0200** <ESC>Q1 <ESC>Z
OUTPUT	(4-13) 
NOTES	Use the Print Position (V and H) commands to locate the new area for the duplicate image. Position of the new target area must not be inside the original image. If you use the Rotate command; the V, H, X, and Y axis will be reversed. If the reference area of the target image exceeds the print area, it will not be printed.

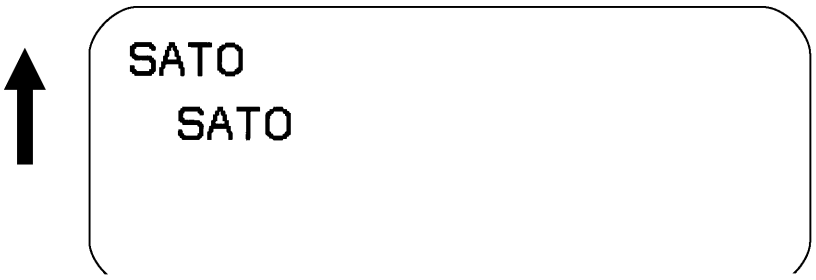
JOURNAL PRINTING	
FUNCTION	To print text in a line by line format on a label. By specifying this command, you automatically select Font XS with a Character Expansion of 2x2. You also establish a base reference point of H2,V2. The character pitch is 2 dots and the line gap is 16 dots. Simply issue an ASCII <CR> at the end of each text line.
FORMAT	<ESC>**J** Place immediately following <ESC>A.
EXAMPLE	<ESC>A <ESC>**J** WITH THE JOURNAL FEATURE YOU CAN PRINT TEXT WITHOUT USING ANY FONT COMMANDS OR POSITION COMMANDS <ESC>Q1 <ESC>Z
OUTPUT	(4-14) 
NOTES	Journal mode assumes a maximum label width. Otherwise, you may print where there is no label and damage your print head. It is effective only for the current print job.

RECALL AND PRINT OF FONT & LOGO	
FUNCTION	Calls and prints fonts and logos downloaded with the exclusive tool.
FORMAT	<ESC>**RF** a = Font ID number (01 to 99) b = Print digit (1 to 9999) n = Print data Place after <ESC>H but before <ESC>Q1.
EXAMPLE	<ESC>A <ESC>H0100<ESC>V0100<ESC>**RF020002,826B** <ESC>Q1 <ESC>Z
OUTPUT	(4-15)
NOTES	Specify the value of Unicode for print data. When calling and printing a logo, specify Print digit: 0002, Print data: <6B82>$_{16}$. Note that <826B>$_{16}$ is the value of Shift JIS code of L.

MIRROR IMAGE	
FUNCTION	To allow mirror image printing of data, such as on transparent labels to be applied to a glass or other transparent surface.
FORMAT	<ESC>**RM** Place after the label data.
EXAMPLE	Label #1 <ESC>A <ESC>A1<ESC>H0100<ESC>V0050<ESC>XL0ABCDEF <ESC>**RM** <ESC>Q1 <ESC>Z
OUTPUT	(4-16)
NOTES	The <ESC>A1 Media defines the area to be mirrored. This command can be used with the Rotate Fixed Base Reference Point (<ESC>%) command. Note that the reference point rotation is dependent upon the location of the <ESC>% command in the data stream. This command should not be specified more than once in any single job. This command cannot be used with commands requiring re-editing of the print area, such as Sequential Numbering, Real time clock or Copy Image Area. Any data outside the area defined by the Media Size (<ESC>A1) command is not mirrored the command is treated as a command error. Any print job containing the <ESC>RM command and without any print data will be treated as a command error.

PRINT POSITION COMMANDS

MEDIA SIZE	
FUNCTION	To set the size of the media.
FORMAT	<ESC>**A1aaaabbbb** aaaa = Label Height in dots (0 to Hmax) bbbb = Label Width in dots (0 to Vmax) Place in a separate data stream to the printer.
INPUT	<ESC>A <ESC>**A108321424** <ESC>Z
OUTPUT	This command does not result in printer output. It is used to automatically adjust the offset values for the size of label being used. The sample command stream specifies a label 832 dots wide by 1424 dots long.
NOTES	The Base Reference point is always the on the right (looking at the front of the printer) side of the print head. This command adjusts the Base Reference Point to correspond with the right edge of the loaded media. If the label size is changed, then this command must be re-specified to center the print image on the label. All eight variables “aaaa” and “bbbb” must be included in this command.

PRINT POSITION	
FUNCTION	The Horizontal and Vertical commands specify the top left corner of a field or label, using the current base reference point as an origin. They also establish a reference point for subsequent fields until the next horizontal and/or vertical print position command is issued.
FORMAT	Horizontal Position: <ESC>**Haaaa** Vertical Position: <ESC>**Vbbbb** aaaa = Number of horizontal dots from base reference point (1 to Hmax) bbbb = Number of vertical dots from base reference point (1 to Vmax) Place preceding any print field description of lines/boxes, fonts, bar codes, or graphics.
EXAMPLE	<ESC>A <ESC>**H0025<ESC>V0050**<ESC>L0303<ESC>MSATO <ESC>**H0100<ESC>V0150**<ESC>MSATO <ESC>Q2 <ESC>Z
OUTPUT	(4-17) 
NOTES	To expand the print length to the maximum limit, the Expanded Print Length (<ESC>EX0) command must be used. If any part of an image is placed past maximum allowable dots across the label, that part of the image will be lost. Leading zeroes do not have to be entered - command “V1” is equivalent to “V0001”. **Refer to Appendix: Reference Tables 9 & 10 for additional information.**

FONT COMMANDS

FONTS: S, M, U, OA, OB, XB, XL, XS, XM, XU

FUNCTION	To print text images on a label. These are eight of the built-in fonts available on the printer. All matrices include descenders.
FORMAT	Font XU: <ESC>**XU** Font U: <ESC>**U** Font XS: <ESC>**XS** Font S: <ESC>**S** Font XM: <ESC>**XM** Font M: <ESC>**M** Font OA: <ESC>**OA** Font OB: <ESC>**OB** Place preceding the data to be printed.
EXAMPLE	<ESC>A <ESC>PS <ESC>H0001<ESC>V0100<ESC>L0202<ESC>**XUSATO** <ESC>H0001<ESC>V0175<ESC>L0202<ESC>**XSSATO** <ESC>H0001<ESC>V0250<ESC>L0202<ESC>**XMSATO** <ESC>H0001<ESC>V0325<ESC>L0101<ESC>**OASATO** <ESC>H0001<ESC>V0400<ESC>L0101<ESC>**OBSATO** <ESC>H0300<ESC>V0100<ESC>L0202<ESC>**USATO** <ESC>H0300<ESC>V0175<ESC>L0202<ESC>**SSATO** <ESC>H0300<ESC>V0250<ESC>L0202<ESC>**MSATO** <ESC>Q1<ESC>Z
OUTPUT	(4-18)
NOTES	Characters may be enlarged through the use of the Character Expansion command and character spacing may be altered through the use of the Character Pitch command. The default is 2 dots between characters. Custom characters or fonts may also be created - refer to Custom-Designed Characters (<ESC>T) command. It is recommended to use a spacing of 5 dots for OCR-A and 1 dot for OCR-B. The matrices for the OA and OB fonts are scaled so that they will remain a constant size according to the OCR-A and OCR-B specifications when printed on different resolution printers. The proportionally spaced fonts XU, XS, XM, XL and XA can be printed with fixed spacing using the Proportional Space (<ESC>PS) command. **Refer to Appendix: Reference Tables 11 through 19 for additional information.**

SMOOTHING FONTS: WB, WL, XB, XL

FUNCTION	To print text images on a label. These are the four auto-smoothing fonts available on the printer.
FORMAT	Font WB: <ESC>**WBa** Font XB: <ESC>**XBa** Font WL: <ESC>**WLa** Font XL: <ESC>**XLa** a = 0: Disables auto-smoothing of font 1: Enables auto-smoothing of font (see notes below) Place preceding the data to be printed.
EXAMPLE	<ESC>A <ESC>PS <ESC>H0001<ESC>V0100<ESC>**WB0SATO** <ESC>H0001<ESC>V0185<ESC>**WB1SATO** <ESC>H0001<ESC>V0270<ESC>**WL0SATO** <ESC>H0001<ESC>V0355<ESC>**WL1SATO** <ESC>H0300<ESC>V0100<ESC>**XB0SATO** <ESC>H0300<ESC>V0185<ESC>**XB1SATO** <ESC>H0300<ESC>V0270<ESC>**XL0SATO** <ESC>H0300<ESC>V0355<ESC>**XL1SATO** <ESC>Q1 <ESC>Z
OUTPUT	(4-19)
NOTES	Auto-smoothing (when enabled) is only effective if the character expansion rate is at least (3) times in each direction. Characters may be enlarged through the use of the Character Expansion (<ESC>L) command. Character spacing may be altered through the use of the Character Pitch (<ESC>A) command. A font must be defined for each field to be printed. There is no default font.

FONT, RASTER	
FUNCTION	To print point size characters created using font definitions.
FORMAT	<ESC>A<ESC>**>RDabb,ccc,ddd,eee,nn. . .n**
	a = A: CG Times B: CG Triumvirate C: MKaiS0-Medium-U (Simplified) c: MHeiS-Bold-U (Traditional) K: HYRGoThic-Medium T: AngsanaUPC F: Futura2Book P: CG Palacio S: CG Century Schoolbook G: CG Triumvirate Condensed V: Universe Medium t: CG Times
	bb = 0: No character set 1: ISO 8859/1 Latin1 2: ISO 8859/2 Latin2 3: ISO 8859/9 Latin5 4: CP-737 DOSGreek 5: CP-885 DOSCyrillic 6: CP-864 DOSArabic 7: CP-874 Thai 8: CP850 Multilingal
	ccc = 0: No character set
	ddd = Horizontal size (4 - 999 dots or P02 - P99)
	eee = Vertical size (4 - 999 dots or P02 - P99)
	nn..n = Data to be printed.
	Place within the normal command stream.
EXAMPLE	<ESC>A <ESC>V0100<ESC>H0100 <ESC>**RDA00,P28,P28,CG Times** <ESC>V0200<ESC>H0100 <ESC>**RDB00,075,075,CG Triumvirate** <ESC>Q1 <ESC>Z

FONT, RASTER	
OUTPUT	(4-20)
NOTES	The “cccc” Horizontal Size and “dddd” Horizontal Size parameters can be entered either in dots or points, but both parameters must use the same value types. If point size is used, the point size is preceded by a “P”. **Refer to Appendix: Reference Tables 20 & 21 for additional information.**

FONT, VECTOR

FUNCTION

To specify printing of the unique SATO vector font. The vector font allows large characters to be printed with smooth, round edges. Each character is made of a number of vectors (or lines), and will require slightly more printer compiling time.

FORMAT

Specify Vector Font: <ESC>**$a,b,c,d**

Data for Vector Font: <ESC>**$=(data)**

a = A: Helvetica Bold (proportional spacing)
B: Helvetica Bold (fixed spacing)

b = Font width (50-999)

c = Font height (50-999 dots)

d = Font variation (0-9) as follows:
0: Standard
1: Standard open (outlined)
2: Gray (mesh) pattern 1
3: Gray (mesh) pattern 2
4: Gray (mesh) pattern 3
5: Standard open, shadow 1
6: Standard open, shadow 2
7: Standard mirror image
8: Italic 9 Italic open, shadow

Place immediately preceding the data to be printed.

EXAMPLE

<ESC>A
<ESC>H0100<ESC>V0100<ESC>**$A,100,100,0**
<ESC>**$=SATO AMERICA**
<ESC>H0100<ESC>V0200<ESC>**$=VECTOR FONT**
<ESC>H0100<ESC>V0350<ESC>**$A,200,300,8<ESC>$=SATO**
<ESC>Q1<ESC>Z

OUTPUT

(4-21)

NOTES

The Pitch command can be used with Vector fonts. If the font size designation is out of the specified range, a default value of 50 is used.

The font width and height values include ascenders, descenders, and other space. A font must be defined for each field to be printed. There is not a default font.

Refer to Appendix: Reference Tables 22 & 23 for additional information.

BARCODE COMMANDS

BAR CODES

FUNCTION	To print bar code images on a label.
FORMAT	2:5 narrow/wide ratio: <ESC>**BDabbcccd** 1:3 narrow/wide bar ratio: <ESC>**Babbcccd** 1:2 narrow/wide bar ratio: <ESC>**Dabbcccd** a = 0: Codabar 1: Code 39 2: Interleaved 2 of 5 (I 2/5) 3: UPC-A / EAN-13 4: EAN-8 5: Industrial 2 of 5 6: Matrix 2 of 5 7: reserved 8: reserved 9: reserved A: MSI B: reserved C: Code 93 D: reserved E: UPC-E F: Bookland G: Code 128 I: SSCC bb = Number of dots (01-12) for narrow bar and narrow space ccc = Bar height in dots (001-999) d = SSCC only. Not used for other bar code types 0: No human readable text 1: Human readable at top 2: Human readable at bottom Place immediately preceding the data to be encoded.

BAR CODES

EXAMPLE

Note: Carriage Returns and Line Feeds have been added to the command listing for clarity and should not be included in the actual data stream.

<ESC>A
<ESC>H0025<ESC>V0025<ESC>B103100*CODE 39*
<ESC>H0155<ESC>V0130<ESC>XS*CODE 39*
<ESC>H0025<ESC>V0200<ESC>BD20210045676567
<ESC>H0075<ESC>V0310<ESC>XM45676567
<ESC>H0025<ESC>V0375<ESC>BD30215001234567890
<ESC>H0025<ESC>V0600<ESC>BD50210012345
<ESC>H0175<ESC>V0710<ESC>XS12345
<ESC>H0025<ESC>V0775<ESC>BD60210012345
<ESC>H0105<ESC>V0885<ESC>XS12345
<ESC>H0025<ESC>V0950<ESC>BA03100123455
<ESC>H0095<ESC>V1060<ESC>XS12345
<ESC>H0025<ESC>V1125<ESC>BC03100081234ABCD
<ESC>H0080<ESC>V1240<ESC>XS1234ABCD
<ESC>H0525<ESC>V0025<ESC>B002100A12345B
<ESC>H0565<ESC>V0135<ESC>XS12345
<ESC>H0475<ESC>V0200<ESC>BD303100123456789012
<ESC>H0525<ESC>V0375<ESC>BD4031001234567
<ESC>H0525<ESC>V0550<ESC>DE03100123456
<ESC>H0500<ESC>V0600<ESC>OB0
<ESC>H0533<ESC>V0655<ESC>OB123456
<ESC>H0350<ESC>V0725<ESC>D30315009827721123
<ESC>L0101<ESC>H0320<ESC>V0800<ESC>OB0
<ESC>H0365<ESC>V0878<ESC>OB98277
<ESC>H0505<ESC>V0878<ESC>OB21123
<ESC>H0665<ESC>V0760<ESC>BF0313021826
<ESC>H0680<ESC>V0730<ESC>OB21826
<ESC>H0425<ESC>V1125<ESC>D30315000633895260
<ESC>L0101<ESC>H0395<ESC>V1200<ESC>OB0
<ESC>H0440<ESC>V1278<ESC>OB06338
<ESC>H0580<ESC>V1278<ESC>OB95260
<ESC>H0730<ESC>V1155<ESC>BF0314024
<ESC>H0745<ESC>V1125<ESC>OB24
<ESC>H0325<ESC>V0950<ESC>BG03100>GAB>D789>C123456
<ESC>H0435<ESC>V1055<ESC>XSAB789123456 <ESC>Q1<ESC>Z

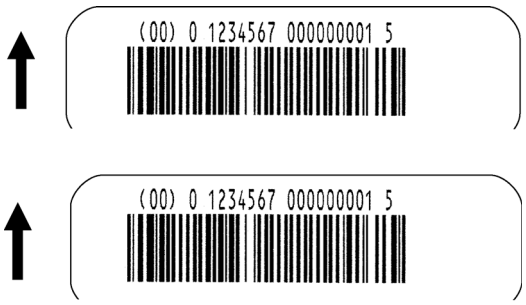
BAR CODES

OUPUT

Without Incrementing:

<ESC>A<EXC>H0100<EXC>V0100
<ESC>**BI10415010123456700000001**
<ESC>Q2<ESC>Z

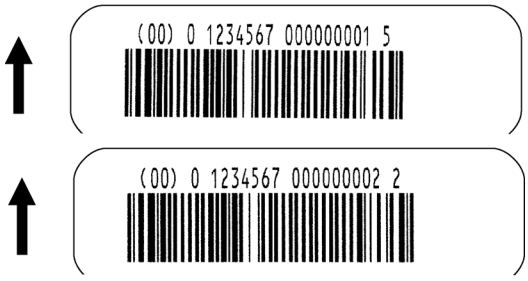
(4-22a)



With Incrementing:

<ESC>A<ESC>H0100<ESC>V0100
<ESC>**F001+001**<ESC>**BI10415010123456700000001**
<ESC>Q2<ESC>Z

(4-22b)



NOTES

UPC and EAN bar codes are not affected by the different types of narrow to wide ratios. Instead, the <ESC>D command adds descender bars to these codes where needed to meet UPC specifications. The <ESC>BD command puts desender bars and human readable text below the symbol.

The Code 128, UCC 128, MSI, and Code 93 bar codes are not affected by the narrow to wide ratios.

The Codabar, Code 39, Industrial 2 of 5, and Matrix 2 of 5 bar codes are affected by the Character Pitch command. This command must be placed before the Bar Code command.

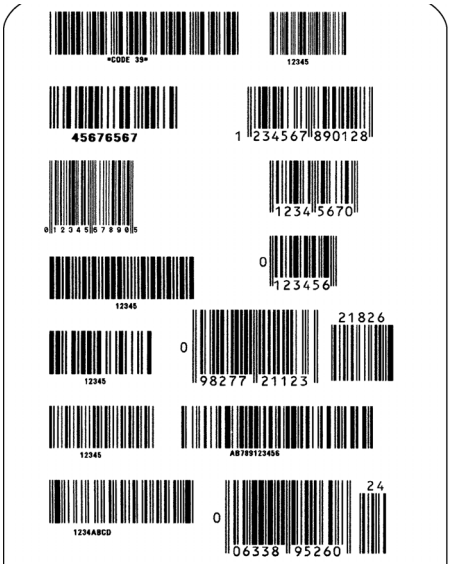
Because of their unique characteristics, two-dimensional (2D) symbols are covered separately.

For UCC128, the FNC1 code is automatically inserted and the Mod 10 and Mod 103 check digits are automatically calculated. For the MSI bar code, the check digit is not automatically calculated.

The <ESC>D and <ESC>BD commands are not valid for the MSI, Code 128, Code 93, UPC-E, Bookland, UCC128 and Postnet symbologies.

Refer to Appendix: Reference Tables 24 through 26 for additional information.

BARCODE, HUMAN READABLE INFORMATION (HRI)

FUNCTION	Specifies the character type of human readable information (HRI) for barcode.
FORMAT	<ESC>**da** a = Barcode type 3: JAN/EAN13 4: JAN/EAN8 H: UPC-A b = Narrow Bar Width (01 to 12 dots) c = Barcode Height (001 to 999 dots) n = Print Data (barcode data) d = Character Type Specification (XU,XS, XM, XB, XL, OA, OB) n = Print Data (HRI data) Place anywhere after <ESC>V but before <ESC>Q.
EXAMPLE	<ESC>A <ESC>H0100<ESC>V0100<ESC>**d3021204902471006795** <ESC>Q1 <ESC>Z
OUTPUT	(4-22c) 
NOTES	Adds HRI with a specified character type. If data with other than the specified value is set, printing will not be performed. When the barcode enlargement ratio and character type is large, HRI may be overlapping each other. The printer will properly lay out HRI. HRI for JAN/WAN13 and UPC-A requires the following items: 8 dots/mm (203 dpi), “02” and “03” is the proper value for narrow bar width. 12 dots/mm (305 dpi), “03” and “04” is the proper value for narrow bar width. 24 dots/mm (309 dpi), “06”, “07”, and “08” is the proper value for narrow bar width.

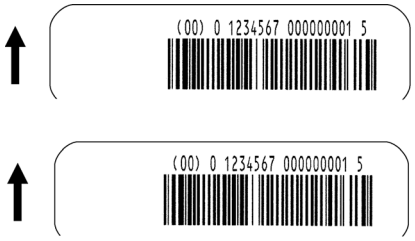
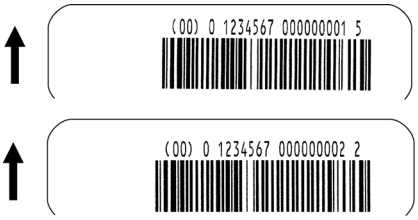
EAN/UCC COMPOSITE SYMBOL	
FUNCTION	Specifies the composite symbol of EAN/UCC.
FORMAT 1	<ESC>**EUaabbn~n** a = 1D barcode symbology a = 01 : RSS-14 02 : RSS-14 (Truncated) 03 : RSS-14 (Stacked) 04 : RSS-14 (Stacked Omnidirectional) 05 : RSS (Limited) 07 : UPC-A 08 : UPC-E 09 : EAN13 10 : EAN8 b = Minimum Bar Width (01 to 12 dots) n = Print Data (Sum of 1D and 2D codes up to 120-digit) Place anywhere after <ESC>V but before <ESC>Q.
FORMAT 2	<ESC>**EUaabbcccn~n** a = 1D barcode symbology a = 11 : UCC/EAN128 with CC-A/B 12 : UCC/EAN128 with CC-C b = Minimum Bar Width (01 to 12 dots) c = Height of Barcode (001 to 500 dots) *Specify the value of [Height of barcode] when setting [Minimum bar width] to [01]. For instance, if setting [Minimum bar width] is [03] / [Height of barcode] is [100], [Height of barcode] will be 300 dots. n = Print Data (Sum of 1D and 2D codes up to 120-digit) Place anywhere after <ESC>V but before <ESC>Q.
EXAMPLE	<ESC>A<ESC>V0100<ESC>H0100<ESC>**EU01040361234567890|11990102** <ESC>Q1<ESC>Z
NOTES	This command does not support RSS Expand. Print of HRI cannot be designated with this command. If the value in 1D barcode symbology is not set to the data portion, composite symbol will not be printed.

CODE 93	
FUNCTION	Specifies CODE93 barcode.
FORMAT	<ESC>**BCaabbbccn~n** a = Narrow bar width (01 to 12 dots) b = Barcode Height (001 to 999 dots) c = Data Digit Number (01 to 99) n = Print Data (barcode data) Place anywhere after <ESC>V but before <ESC>Q.
EXAMPLE	<ESC>H0100<ESC>V1125<ESC>**BC0310008123** <ESC>H0155<ESC>V1240<ESC>XS1234ABCD
OUTPUT	(4-23)
NOTES	The quantity of digit data and input data must be equal. A command error will occur if the digit data and input data are not equal.

BOOKLAND	
FUNCTION	Specifies Bookland barcode.
FORMAT	<ESC>**BFaabbn~n** a = Narrow bar width (01 to 03dots) b = Barcode Height (001 to 999 dots) n = Print Data (numeric (0 to 9) 2 to 5 digits) Place anywhere after <ESC>V but before <ESC>Q.
EXAMPLE	<ESC>H0325<ESC>V0725<ESC>D30315009827721123 <ESC>L0101<ESC>H0295<ESC>V0800<ESC>ESC>OB0 <ESC>H0340<ESC>V0878<ESC>OB98277 <ESC>0480<ESC>V0878<ESC>OB21123 <ESC>H640<ESC>V0760<ESC>**BF0313021826** <ESC>H655<ESC>V0730<ESC>OB21826
OUTPUT	(4-24)
NOTES	Only numeric can be specified as print data. Refer to the attached table.

CODE128	
FUNCTION	Specifies CODE128 barcode.
FORMAT	<ESC>**BGaabbbn~n** a = Narrow bar width (01 to 12 dots) b = Barcode Height (001 to 999 dots) n = Print Data (barcode data) Place anywhere after <ESC>V but before <ESC>Q.
EXAMPLE	<ESC>H0200<ESC>V0550<ESC>**BG03100>GAB>B789>C123456** <ESC>H0310<ESC>V665<ESC>XSAB789123456
OUTPUT	(4-25)
NOTES	Specify Start Code at the head of the data. (1) Start Code A = <ESC>G (2) Start Code B = <ESC>H (3) Start Code C = <ESC>I When using “Start Code C”, specify the print data in even numbered digits. When the print data contains an odd number of digits, specify “Start Code A” or B” to change the first character of the print data. Examples: 1) 15 digits [123456789012345] <ESC>B1<ESC>C23456789012345 2) 9 digits/Alphanumeric 6 digits [123456789ABC123] <ESC>C12345678<ESC>B9ABC123 If using “Start Code C” to specify an odd numbered digit, “0” will be added to the end of the print data before printing. When a Start Code is omitted, data will be printed with “Start Code B”. **Refer to Appendix: Reference Table 27 for additional information.**

SSCC	
FUNCTION	Specifies SSCC (Serial Shipping Container Code) barcode.
FORMAT	<ESC>**Blaabbbcn~n** a = Narrow bar width (01 to 12 dots) b = Barcode Height (001 to 999 dots) c = Barcode Expository Font Specification 0: No HRI 1: HRL available (upper part) 2: HRI available (lower part) n = Print Data For barcode data, refer to the UCC/EAN128 code table. EAN128 (Barcode for Standard Carton ID) fixed 18 digits: Identifier of a continuous code for freight packaging Type of packaging Country/manufacturer code Serial number for shipping container Check digit *Note that check digit is automatically added; therefore, specify data in 17 digits excluding check digit.* Place anywhere after <ESC>V but before <ESC>Q.
EXAMPLE	Without incrementing: <ESC>A <ESC>H0100<ESC>V0100<ESC>**BI10415010123456000000001** <ESC>Q2 <ESC>Z With incrementing: <ESC>A <ESC>H0100<ESC>V0100<ESC>F001+001 <ESC>**BI10415010123456700000001** <ESC>Q2 <ESC>Z

SSCC	
OUTPUT	Without incrementing: (4-26a)  With incrementing: (4-26b) 
NOTES	UCC128 code is exclusive to Standard Carton ID. When printing in EAN128, designed for the markets in the medical, fresh food, or flowers and plants, use CODE128 Barcode <ESC>BG to specify print data with application identification or separator that matches each specification. Start character code, function character, end character code, and identification code (corresponds only to “00”) are added automatically. Modulus 10 check character and modulus 103 check character are automatically generated. Sequential number of barcode data is available. Line pitch between barcode and expository font is fixed at 10 dots. If the width of expository font is wider than that of the barcode, it starts printing from the print start position of barcode. If the width of expository font is narrower than that of the barcode, expository font will be aligned to the center of barcode for printing. Prints expository font in OCR-B. If the expository font is outside of the print area, it will not be printed. When HRI is available, specify Vertical Print Position (<ESC>V) and Horizontal Print Position (<ESC>H) in consideration of print of expository font.

POSTNET	
FUNCTION	To print Postnet bar codes.
FORMAT	<ESC>**BPn...n** n...n = 5 digits (Postnet-32 format) 6 digits (Postnet-37 format) 9 digits (Postnet-52 format) 11 digits (Postnet-62, Delivery Point format) Place immediately preceding the data to be encoded.
EXAMPLE	<ESC>A <ESC>H0100<ESC>V0120<ESC>**BP94089** <ESC>H0100<ESC>V0160<ESC>**BP123456** <ESC>H0100<ESC>V0200<ESC>**BP123456789** <ESC>H0100<ESC>V0240<ESC>**BP12345678901** <ESC>Q1 <ESC>Z
OUTPUT	(4-27)
NOTES	If the number of data digits does not match those listed, the command is ignored. Only numeric data will be accepted.

VARIABLE RATIO BARCODES

FUNCTION

To print a bar code with a ratio other than those specified through the standard bar code commands (B,BD, and D). This is done through individual control of each of the bar code elements (bars, spaces) as shown above. Remember that this command only applies to the five bar code types shown.

FORMAT

<ESC>**BTabbccddee**

a = Bar Code Symbol:
- 0: Codabar
- 1: Code 39
- 2: Interleaved 2 of 5
- 5: Industrial 2 of 5
- 6: Matrix 2 of 5

bb = Narrow space in dots (01 to 99)

cc = Wide space in dots (01 to 99)

dd = Narrow bar in dots (01 to 99)

ee = Wide bar in dots (01 to 99)

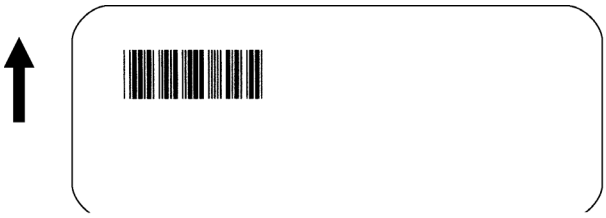
Place following the print position commands and preceding <ESC>BW.

EXAMPLE

```
<ESC>A
<ESC>H0050<ESC>V0050<ESC>BT101030103
<ESC>BW03100*1234*
<ESC>Q1
<ESC>Z
```

OUTPUT

(4-28)

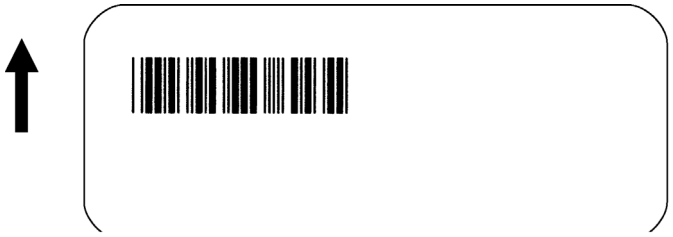


NOTES

This command must be immediately followed by the Bar Code Expansion (<ESC>BW) command.

You may use only one variable ratio bar code per label.

If the data specified in this command is incorrect, the command is ignored and the ratio used will be based on the previous setting.

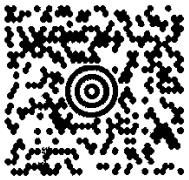
BARCODE EXPANSION	
FUNCTION	This command works together with the <ESC>BT command to specify an expansion factor and the bar code height for the particular symbol being printed.
FORMAT	<ESC>**BWabbb** aa = Expansion factor by which the width of all bars and spaces will be increased (01 to 12) bbb = Bar height by dot (004 to 999 dots) Place immediately following the <ESC>BT command and preceding data to be encoded.
EXAMPLE	<ESC>A <ESC>H0050<ESC>V0050<ESC>BT101030103 <ESC>**BW04100*1234*** <ESC>Q1 <ESC>Z
OUTPUT	(4-29) 
NOTES	This command must be preceded by the Variable Ratio Bar Codes (<ESC>BT) command. The following bar codes will be affected by the Character Pitch command: Codabar, Code 39, Interleaved 2 of 5, Matrix 2 of 5.

2D CODE COMMANDS

PDF417

FUNCTION	Specifies PDF417 of 2D code.
FORMAT	<ESC>**BKaabbcddeeffffg~g, h** a = Minimum Module Width (01 to 09 dots) b = Minimum Module Height (01 to 24 dots) c = Security Level (0 to 8) d = Number of Data Code Words per Digit (01 to 30) 00: Automatic (width depends on data number specified) e = Digit Number per Symbol (03 to 90) 00: Automatic (height depends on data number specified) f = Data Digit Number (0001 to 2681) g = Print Data (data) h = PDF Code Type When omitted: PDF417 T: Truncated scale M: Micro PDF n = Low Priority Message (alphanumeric/symbol) Place anywhere after <ESC>V but before <ESC>Q.
EXAMPLE	<ESC>V0100<ESC>H0100<ESC>**BK0607400000021PDF417 PDF417 PDF417**
OUTPUT	(4-30)
NOTES	The minimum module width can be set to 01 and 02; however, it may not read properly. 01, 02, and 03 are designable for minimum module height and may cause a reading problem. If specifying “00” for Number of Data Code Words per Digit and Digit Number per Symbol, the size of height to width (aspect ratio) will be at 1:2 based on the number of print data. If increasing the security level, it is necessary to specify a higher value for Digit Number per Symbol or Number of Data Code Words per Digit. The maximum Digit Number of Data is 2681; however, it may vary depending on the specification of minimum module size, security level, and print data type. If the specification of parameter or number of data is not matching, printing will not be properly performed.

QR CODE	
FUNCTION	Specifies QR Code of 2D code.
FORMAT	<ESC>**BQ** (Manual setting) <ESC>**BQ** (Auto setting) a = Error correction level 1: 7% high density 2: 15% standard 3: 30% high reliability 4: 25% b = Concentration mode 0: Normal mode 1: Concentration mode c = Cell size (01 to 32) d = Number of partitions by concentration mode (01 to 16) e = Sequential number partitioned by concentration mode (01 to 16) f = Concentration mode parity data (00 to ff) g = Character mode 1: Number mode 2: Alphanumeric mode 3: Binary mode h = Data number (0001 to 7366) n = Data Place anywhere after <ESC>V but before <ESC>Q.
EXAMPLE	<ESC>A <ESC>H0100<ESC>V0100<ESC>**BQ3010,112345** <ESC>Q1 <ESC>Z
OUTPUT	(4-31)
NOTES	Carry out XOR logic operation of all the partitioned print data of the QR code and then, specify this operation data in hexadecimal character. This is referred to as “Parity Data”. When the character mode is set to other than binary mode, it is not necessary to set the data number parameter.

MAXI CODE	
FUNCTION	Specifies Maxi code of 2D code.
FORMAT	<ESC>**BVa, b, c, ddddddddd, eee, fff, n~n** a = Symbol Number (1 to 8) b = Symbol Digit Number (1 to 8) c = Mode 2: for delivery 3: for delivery 4: standard symbol 6: for reader d = Zip Code (0 to 999999) e = Country Code (001 to 999) f = Service Class (001 to 999) n = Low Priority Message (alphanumeric/symbol) Place anywhere after <ESC>V but before <ESC>Q.
EXAMPLE	<ESC>A<ESC>V0100<ESC>H0100 <ESC>**BV1,1,2,123456789,840,001,[)<RS>01<GS>961Z01547089<GS>UPSN<GS>056872<GS>348<GS>99999999<GS>001/005<GS>029<GS>N<GS><GS>LENEXA<GS>KS<RS><EOT>** <ESC>Q1 <ESC>Z
OUTPUT	(4-32) 
NOTES	For mode 2, specify up to 9 numeric digits; and for mode 3, specify fixed 6 digits (alphanumeric - use English capital letters). “00H” cannot be specified for print data.

DATA MATRIX CODE

FUNCTION	Specifies Data Matrix Code of 2D code.
FORMAT	<ESC>**BXaabbccddeeeffffghh** a = Format ID (01 to 06 dots) b = Error Correction Level 00: ECC000 05: ECC050 08: ECC080 10: ECC100 14: ECC140 20: ECC200 c = Cell Width (01 to 16 dots/cell) d = Cell Pitch (01 to 16 dots/cell) e = Number of Cells per Line (008 to 148) 000: Automatic) f = Number of Cell Line (008 to 148) 000: Automatic g = Mirror Image 0: Normal Image (standard print) 1: Mirror Image h = Guide Cell Size (01 to 15) Place anywhere after <ESC>V but before <ESC>Q.
EXAMPLE	<ESC>V0100<ESC>H0100 <ESC>**BX05051010000000001** <ESC>DCDATA MATRIX DATA MATRIX
OUTPUT	(4-33)
NOTES	If “20” is specified for Error Correction Level, the specification of Format ID, Mirror Image, and Size of Guide Cell will be ignored. “01” and “02” are designable for Cell Width and Cell Pitch; however, they may not read properly. In this case, “00” will be an error. If “000” is specified for Number of Cells per Line and Number of Cell Lines, optimum matrix size is automatically set based on the number of data. The thickness of normal type guide cell is “01”. **Refer to Appendix: Reference Table 28 for additional information.**

DATA MATRIX CODE, DATA	
FUNCTION	Specifies data for the data matrix code of 2D code.
FORMAT	<ESC>**DC** n = Print data Place after <ESC>BX.
EXAMPLE	<ESC>A <ESC>H0100<ESC>V0100<ESC>BX011002020000000001 <ESC>**DC1234567890** <ESC>Q1 <ESC>Z
OUTPUT	This command does not result in printer output. Refer to <ESC>DC for printer output.
NOTES	This code must be placed after the <ESC>BX command.

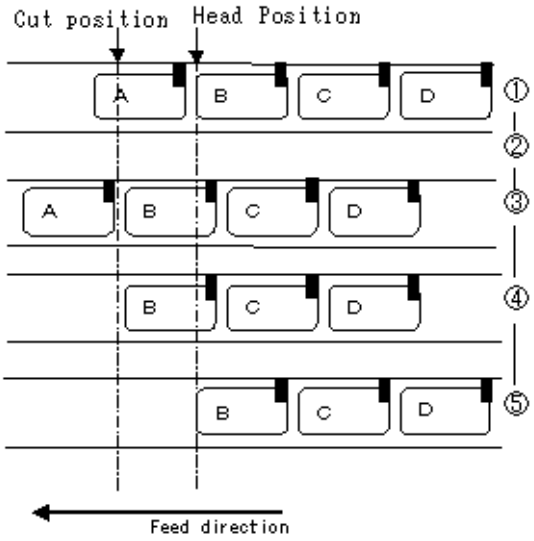
DATA MATRIX CODE, SEQUENTIAL NUMBER

FUNCTION	Specifies sequential numbering for the data matrix code of 2D code.
FORMAT	<ESC>**FX** a = Quantity of duplications to print (001 to 999) b = Flag of increase/decrease +: Increase -: Decrease c = Quantity of increase/decrease (001 to 999) d = Specification of digit position (001 to 999) e = Digit number (001 to 999) Place before <ESC>BX.
EXAMPLE	<ESC>A <ESC>H0100<ESC>V0100<ESC>**FX001+001005003** <ESC>BX011002020000000001 <ESC>DC00006000 <ESC>Q1 <ESC>z
OUTPUT	Label Set 1: (4-34a) Label Set 2: (4-34b)
NOTES	This code must be placed before the <ESC>BX command.

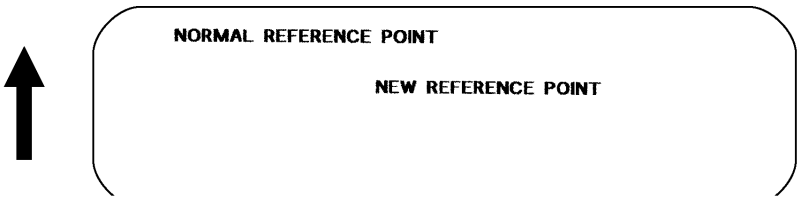
SYSTEM COMMANDS

PRINT SPEED	
FUNCTION	To specify a unique print speed through software for a particular label. This allows flexibility in finding the best performance and quality for the particular label format, media, and ribbon.
FORMAT	<ESC>**CSa** a = Designates the speed selection in ips Place immediately after <ESC>A and immediately before <ESC>Z in a separate data stream. Refer to the product manual for specific print speed increments.
EXAMPLE	<ESC>A <ESC>**CS6** <ESC>Z
OUTPUT	This command does not result in printer output.
NOTES	This becomes the new setting for all subsequent print jobs, unless changed. All subsequent labels will print at this speed unless the speed is changed with this command or through the Operator Panel. The setting is stored in non-volatile memory and is not affected by cycling the power.
GL SPECIFIC DATA	The GL4xxe can be operated at either 8 dots/mm or 12 dots/mm, depending on the print head installed. The parameter range is 1 through 9 for both print resolutions, as follows: 1: 2 ips (50 mm/s) 2: 3 ips (75 mm/s) 3: 4 ips (100 mm/s) 4: 5 ips (125 mm/s) 5: 6 ips (150 mm/s) 6: 7 ips (175 mm/s) 7: 8 ips (200 mm/s) 8: 9 ips (225 mm/s) 9: 10 ips (250 mm/s)

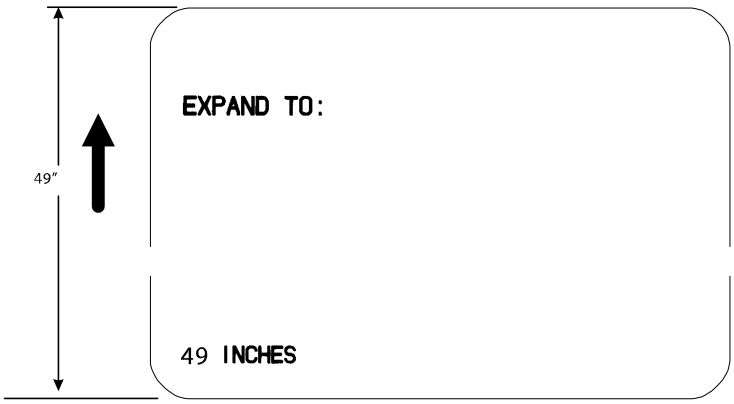
PRINT DARKNESS	
FUNCTION	To specify a new print darkness setting through software control for unique media and ribbon combinations.
FORMAT	<ESC>**#Ea** a = Print Darkness Value Must be placed immediately after <ESC>A and immediately before <ESC>Z in its own separate data stream. Refer to the product manual for specific print speed increments.
EXAMPLE	<ESC>A <ESC>**#E2** <ESC>Z
OUTPUT	This command does not result in printer output.
NOTES	This becomes the new setting in the printer configuration for all subsequent print jobs unless changed. The setting is stored in non-volatile memory and is not affected by cycling power. The lightest setting is the smallest value and the darkest setting is the largest value.
GL SPECIFIC DATA	The format for GL4xxe is <#E>ab, where a [Print darkness level specification] = 1: -15 (Lightest) 2: -7 (Light) 3: 0 (Normal)(Initial value) 4: +7 (Dark) 5: +15 (Darkest) b [Print darkness specification] = A ~ F (Omissible) The initial value is 3, and the valid parameter range is 1 - 5 for 8 dots/mm and 12 dots/mm print head configurations.

CUTTING OPERATION	
FUNCTION	To specify the movement of cutting.
FORMAT	<ESC>**NC**
EXAMPLE	<ESC>A <ESC>**NC** <ESC>Z  ① Label stop position A : Print completed B : Not printed C : Not printed D : Not printed ② Receiving command ③ Feeding label to cutting position ④ Cutting label ⑤ Backfeeding to the head position
NOTES	This command is valid only for the printer equipped with cutter. This command discharges and cuts labels. Delimit Start of Data Transmission <A> and End of Transmission <Z> with this command for use. This command cannot be used in combination with other commands. This command is valid when printer is in standby state after the completion of print.

BASE REFERENCE POINT

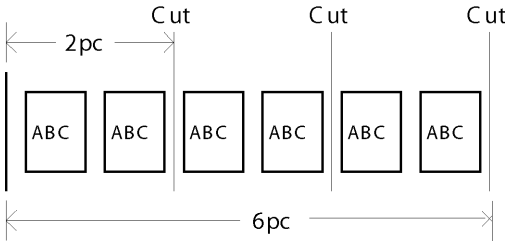
FUNCTION	To establish a new base reference point for the current label. The base reference point is the top left corner or “origin” from where all print position commands are based. This command may be very helpful when using labels less than four inches wide to place images on the printable label surface. It may also be used to move images past preprinted fields on a label.
FORMAT	<ESC>**A3H-aaaa-Vbbbb** - = This character is optional. When present, it specifies that The horizontal offset is in the negative direction. If it is left out the offset direction is positive. aaaa = Horizontal Print Offset (-Hmax to +Hmax) bbbb = Vertical Print Offset (-Vmax to +Vmax) Place preceding all images based on the new base reference point.
EXAMPLE	<ESC>A <ESC>L0202 <ESC>H0025<ESC>V0025<ESC>WB0MNORMAL REFERENCE POINT <ESC>**A3H0300V0075** <ESC>H0100<ESC>V0050<ESC>WB0MNEW REFERENCE POINT <ESC>Q1 <ESC>Z
OUTPUT	(4-36) 
NOTES	Use of this command will set the printer’s Vertical/Horizontal Offset configuration until a new Base Reference Point command is issued or the setting is changed from the operator panel. This command may be used more than once in a print job. An alternative to using this command is to make changes to your current Horizontal and Vertical Print Position commands. Example: If the current base reference point is H=1, V=1 and you wish to move all the fields on your label downward vertically by 150 dots. You could either, (1) add the Base Reference Point command or, (2) change all the vertical position commands by an additional 150 dots. For a more detailed example of the Base Reference Point command, refer to the Introduction unit. The printer will not “wrap” if any part of a character or image extends beyond the last print dot position. It will disappear and not be visible on any part of the label.

PRINT AREA, ENLARGEMENT

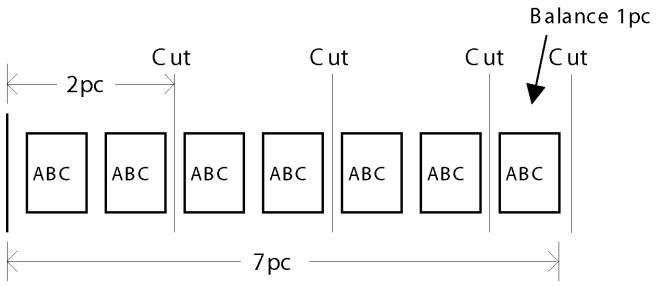
FUNCTION	Specifies the print area to be standard height of 178 mm or enlarged to 356 mm.
FORMAT	**<ESC>AR** Standard print area **<ESC>AX** Enlarged print area Place after <ESC>A within the data stream.
EXAMPLE	<ESC>A <ESC>**AR** <ESC>Z
OUTPUT	(4-37) 
NOTES	This command changes the print area of pitch direction. Insert this command after Start of Data Transmission (<ESC>A). To return to the standard print area, power off the printer to cancel the command.

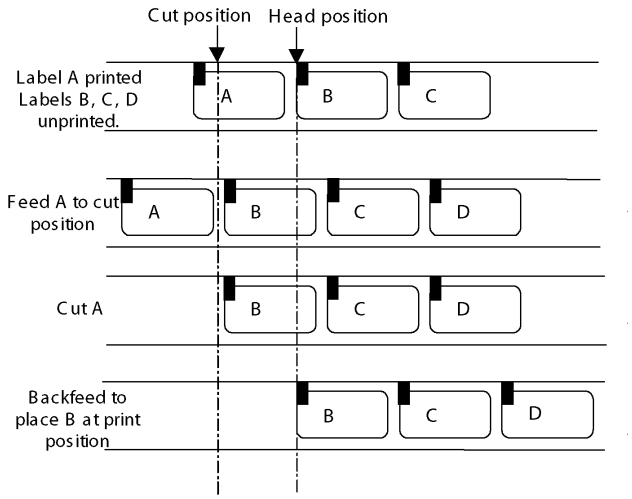
PRINT END POSITION

FUNCTION	Changes the label stop position in the sensor invalid mode.
FORMAT	<ESC>**EP** Place after <ESC>A within the data stream.
EXAMPLE	<ESC>A <ESC>**EP** <ESC>Z
OUTPUT	This command does not result in printer output.
NOTES	None.

CUT, JOB	
FUNCTION	Regulates label cutting when using a cutter assembly with the printer. This command allows the cutting of a multi-part tag or label at a specified interval within a print job.
FORMAT	<ESC>**~aaaa** aaaa = Number of labels to print between each cut (1 to 9999) Place following the Print Quantity command <ESC>Q.
EXAMPLE	<ESC>A <ESC>H0020<ESC>V0020<ESC>XB1ABC<ESC>Q3 <ESC>**~0002** <ESC>Z
OUTPUT	This set of commands will print 6 labels (3 x 2) with two labels between each cut. (4-38) 
NOTES	The optional label cutter must be installed and the printer configured for its use for this function to be valid. If the cut value is (a = 0), the cutter is inactive. A "~" (tilde) character or <NUL> (ASCII 00 Hex) character can be used in this command. It is recommended that the "~" be used whenever possible. When using the Cutter command, the total number of labels printed is the product of the cut value and the print quantity.

CUT, LABEL

FUNCTION	Regulates label cutting when using a cutter assembly with the printer. This command allows the cutting of a multi-part tag or label at a specified interval within a print job. It differs from the <ESC>~ Cut Job command in that it does not interact with the quantity command.
FORMAT	ESC>**~Aaaaa** aaaa = Number of labels to print between each cut (1 to 9999) Place preceding the <ESC>Q Print Quantity command.
EXAMPLE	This set of commands will print seven labels with two labels between each cut. One label will be cut separately.
OUTPUT	(4-39) 
NOTES	The optional cutter assembly must be installed and enabled to use this function. If the cutter option has been enabled in the printer configuration and the cut value is (a = 0), the cutter is inactive. This command is independent of the <ESC>Q Quantity command. It will cut the specified number of labels.

CUT, LAST	
FUNCTION	Regulates label cutting when using a cutter assembly with the printer. This command allows the cutting of a printed multi-part tag or label that is left in the printer after a job is cut.
FORMAT	<ESC>**~B** Place in a separate data stream sent to the printer.
EXAMPLE	<ESC>A <ESC>**~B** <ESC>Z
OUTPUT	This command will feed the last printed label to the cut position, cut the label and then back feed to the head position in preparation for printing the next job. (4-40) 
NOTES	The optional cutter assembly must be installed and enabled to use this function.

CLEAR PRINT JOBS & MEMORY	
FUNCTION	To clear individual memory or buffer areas of the printer.
FORMAT	<ESC>***a** a = If the “a” parameter is not included with this command and the printer is in the multi-buffer mode, this command clears all print jobs in the printer memory, including the current print job. a = If “a” is included with this command, it specifies the internal memory section to be cleared. To clear the custom character memory & To clear the form overlay memory X To clear all internal memory This command should be sent to the printer as an independent data stream.
EXAMPLE	<ESC>A <ESC>* <ESC>Z
OUTPUT	This command does not result in printer output. The current print job in the buffer will be terminated and all other print jobs in the buffer cleared.
NOTES	See Expanded Memory Functions for variations of this command used to clear data from the optional Expanded Memory. It is not necessary to clear the printer’s memory between each print job. The primary purpose of this command is to clear all print jobs in the multi-buffer mode. The “a” parameter can be used in either the multi-buffer or single job mode to clear specific parts of the memory. When the “a” parameter is used, the section of memory specified will not be cleared until the label is printed.

OFFLINE/PAUSE	
FUNCTION	Specifies when, and under what circumstances, the printer goes into an off-line state. When used within a print job, the printer goes off-line after finishing the print job.
FORMAT	<ESC>**@,nn . . . n** nn...n = Optional display message on the LCD (32 characters max.) Place anywhere between <ESC>A and <ESC>Z.
EXAMPLE	<ESC>A <ESC>**@, LOAD BLUE LABELS AND PLACE PRINTER ON-LINE** ...Job... <ESC>Z
OUTPUT	This command does not result in printer output. The printer is placed in the Off-Line mode as soon as the current print job is finished.
NOTES	When using this command and the print job specifies <ESC>Q10, all ten labels will print before the printer goes off-line. Press the LINE key to return the printer to an on-line status.

ONLINE	
FUNCTION	Changes the printer from offline to online status.
FORMAT	<ESC>**OL** Place anywhere between <ESC>A and <ESC>Z.
EXAMPLE	<ESC>A <ESC>**OL** <ESC>Z
OUTPUT	This command does not result in printer output.
NOTES	Up to 32 characters are available for LCD messages. In the printer's Receive Mode, specify the single-item buffer mode. This command is not disclosed to users.

REPEAT LABEL	
FUNCTION	To print a duplicate of the last label printed.
FORMAT	<ESC>**C** Place immediately after <ESC>A and immediately before <ESC>Z in a separate data stream.
EXAMPLE	<ESC>A <ESC>**C** <ESC>Z
OUTPUT	A duplicate of the previous label will be printed.
NOTES	This command will not have an effect if the printer's power is cycled off and back on since printing the previous label.

EEPROM SETUP	
FUNCTION	Registers the operation of the printer in EEPROM.
FORMAT	<ESC>**PG** Place immediately after <ESC>A.
EXAMPLE	<ESC>A <ESC>**PG** <ESC>Z
OUTPUT	This command does not result in printer output.
NOTES	This command is not necessary with normal label printing. The operational settings specified are still in effect after powering off the printer. **Refer to Appendix: Reference Table 29 for additional information.**

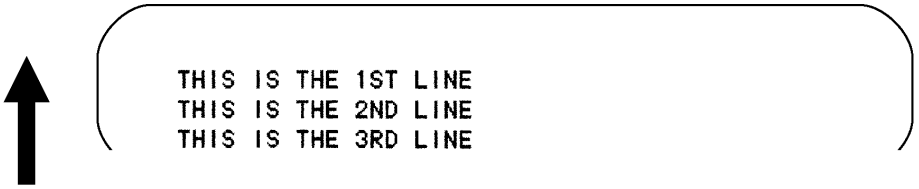
FLASH ROM SETUP	
FUNCTION	Registers the operation of the printer in EEPROM.
FORMAT	<ESC>**PC** Place immediately after <ESC>A.
EXAMPLE	<ESC>A <ESC>**PC26,1** <ESC>Z
OUTPUT	This command does not result in printer output.
NOTES	Go to the Advanced Mode or Service Mode for configuration. These command setting will remain in effect after powering off the printer. The entire or partial parameter entries is omissible by using commas for total settings. Any commas that are omitted will result in those settings remaining as default. **Refer to Appendix: Reference Table 30 for additional information.**

SERIAL INTERFACE, CONFIGURATION

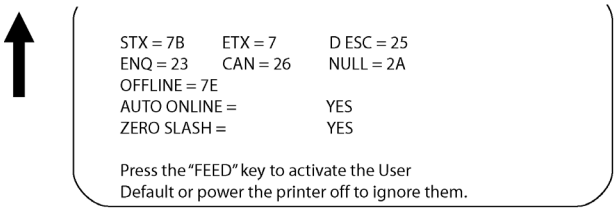
FUNCTION	Specifies the programming configuration of the serial interface.
FORMAT	<ESC>**I2abcde** a = Baud rate 0: 9600 bps 1: 9200 bps 2: 8400 bps 3: 57600 bps b = Data bits 0: 8 1: 7 c = Parity 0: No parity 1: Odd parity 2: Even parity d = Stop bits 0: 1 Stop bit 1: 2 Stop bits e = 0: Single item buffer 1: Multi item buffer 2: X-On/X-Off Flow control 3: Bi-Com 4 4: Bi-Com 3 Place in separate data stream sent to the printer.
EXAMPLE	<ESC>A <ESC>**I230011** <ESC>Z
OUTPUT	This command does not result in printer output.
NOTES	The settings are stored in the EEPROM by this command and they will remain in effect until a new <ESC>I2 command is received. Cycling power will not have an effect on these settings. To change the value stored in the EEPROM, use the <ESC>PC Printer Setting command or use the Printer Setting Utility program contained on the CDROM shipped with the printer. All command parameters must be present in the data stream sent to the printer. Selecting X-On/X-Off, Bi-Com3 or Bi-Com4 will automatically place the printer in the Multi Buffer mode.

SENSOR TYPE	
FUNCTION	To select a label sensing method for a print job.
FORMAT	<ESC>**IGa** a = 0: Reflective (Eye-Mark) sensor 1: Gap (transmissive) sensor 2: Sensor not used. Place in separate data stream sent to the printer.
EXAMPLE	<ESC>A <ESC>**IG1** <ESC>Z
OUTPUT	This command does not result in printer output.
NOTES	When the power is cycled, the value set by this command is lost and replaced by the default value stored in the EEPROM. To change the value stored in the EEPROM, use the Printer Setting (<ESC>PC) command or use the Printer Setting Utility program contained on the CD-ROM shipped with the printer.

LINE FEED

FUNCTION	To print multiple lines of the same character size without specifying a new print position for each line.
FORMAT	<ESC>**Eaaa** aaa = Number of dots (001-999) between the bottom of the characters on one line to the top of the characters on the next line. Place preceding the text that will use the line feed function.
EXAMPLE	<ESC>A <ESC>**>E010**<ESC>H0050<ESC>V0050<ESC>L0202<ESC>S THIS IS THE 1ST LINE<CR> THIS IS THE 2ND LINE<CR> THIS IS THE 3RD LINE<CR> <ESC>Q1<ESC>Z
OUTPUT	(4-41) 
NOTES	With the Line Feed (<ESC>E) command, specify the number of dots you want between each line. Then, send an ASCII <ESC>CR at the end of each line of text. The printer automatically identifies the size of the last character, moves down the number of dots specified, and begins printing the next line. It is effective only for the current data stream. When printing lines or boxes in the same data stream with the Line Feed command, the Lines and Boxes command should be specified last, preceding Quantity (<ESC>Q) command. This command is invalid only if the value specified is zero. Following this command with a <ESC>CR character will allow printing with auto line feed. The print position will be determined from the value specified and the H value set in the printer. If several “H” values are specified after this command, the print position will be determined by the “H” value last specified. The font to be used must be redefined after each “H” command.

USER DOWNLOAD

FUNCTION	Allows the user to define custom Protocol Command codes.
FORMAT	<ESC>**LDa,** a = Replacement character for STX b = Replacement character for ETX c = Replacement character for ESC d = Replacement character for ENQ e = Replacement character for CAN f = Replacement character for NUL g = Replacement character for OFFLINE h = Auto-Online. Printer powers up in the online mode. 0: Yes 1: No i = Zero Slash. Places a slash through the “0” character. 0: Yes 1: No j = Hexa-decimal character for Euro-character Place immediately following <ESC>A within its own stream.
EXAMPLE	<ESC>A **<ESC>LD,{,},%,#,&,*,~,0,0,D5** <ESC>Z
OUTPUT	A Protocol Command code status label will be printed as a result of the successful download of a custom set of Protocol Command codes. (4-42) 
NOTES	Commas must be used to separate the parameters. If a parameter is omitted between two commas, the default Non-Standard Protocol Command codes for that parameter will be used. If more or less than 10 commas is included in the command, the entire command sequence will be ignored. If a combination of characters are outside the hexadecimal range, the entire command sequence will be ignored. Downloading Auto Online and Zero Slash settings will overwrite the values selected using the LCD panel. If these settings are changed using the LCD panel, they will overwrite any previously downloaded settings. **Refer to Appendix: Reference Table 31 for additional information.**

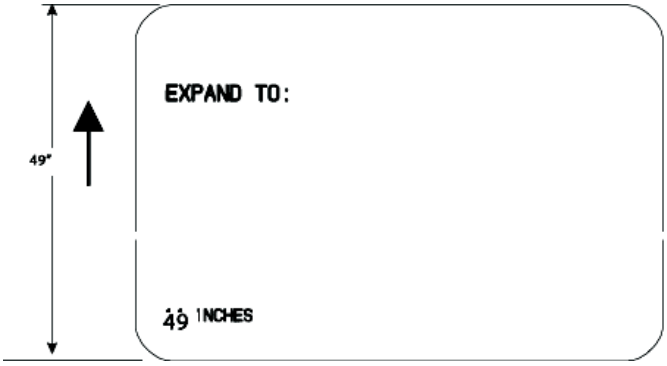
LANGUAGE	
FUNCTION	Specifies the display language for the LCD.
FORMAT	<ESC>**LAa** a = Bar Code Symbol 0: English 1: French 2: German 3: Spanish 4: Italian 5: Portuguese 6: Extensible language (Japanese, etc.) Place immediately following <ESC>A.
EXAMPLE	<ESC>A <ESC>**LA0** <ESC>Z
OUTPUT	This command does not result in printer output.
NOTES	This function may also be set through the LCD and is not disclosed to users. Option 6 above is not valid without a memory card change.

CR/LF DELETION	
FUNCTION	Configures the deletion function of CR/LF.
FORMAT	<ESC>**CLa** a = 0: Normal (no deletion) 1: Delete CR/LF Place anywhere between <ESC>A and <ESC>Z.
EXAMPLE	<ESC>A <ESC>**CL1** <ESC>Z
OUTPUT	This command does not result in printer output.
NOTES	This function may be set through the LCD and is not disclosed to users.

ZERO SLASH	
FUNCTION	To allow printing of numeric zeroes with a slash.
FORMAT	<ESC>**LHa** a = 0: Print zeroes without slash 1: Print zeroes with slash Place in a separate data stream before any label data is transmitted.
EXAMPLE	<ESC>A <ESC>**LH0** <ESC>Z
OUTPUT	This command does not result in printer output.
NOTES	This command can also be set using the LCD panel. The last setting received, whether it is via this command or manually input via the LCD panel will be active.

AUTO ONLINE	
FUNCTION	To allow the printer to power up in the Online mode ready to receive data.
FORMAT	<ESC>**AOa** a = 0: Printer automatically powers up in the Online mode. 1: Printer automatically powers up in the Offline mode. Place in a separate command stream before label data is transmitted to the printer.
EXAMPLE	<ESC>A <ESC>**AO1** <ESC>Z
OUTPUT	This command does not result in printer output.
NOTES	This command can also be set using the LCD panel. The last setting received, whether it is via this command or manually input via the LCD panel will be active. The printer default setting can be set by user download.

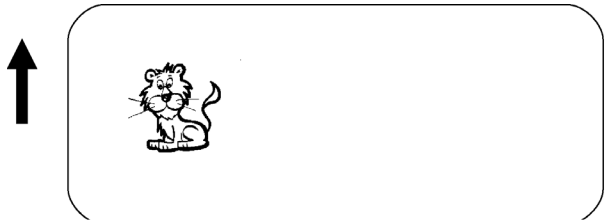
ONLINE FEED	
FUNCTION	Enables label feeding when in the online mode.
FORMAT	<ESC>**LFa** a = 0: Enables label feed when online. 1: Disables label feed when online Place in a separate command stream before label data is transmitted to the printer.
EXAMPLE	<ESC>A <ESC>**LF0** <ESC>Z
OUTPUT	Feeds a blank label when entering the online mode.
NOTES	This command can also be set using the LCD panel. The last setting received, whether it is via this command or manually input via the LCD panel will be active. The printer default setting can be set by user download.

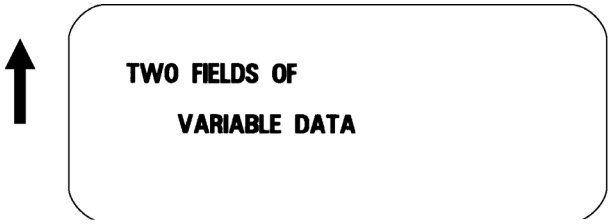
PRINT LENGTH, EXPANSION	
FUNCTION	To increase the maximum print length (in feed direction) for a label.
FORMAT	<ESC>**EX0** Sets the print length to maximum <ESC>**AR** Resets the maximum print length to 7" (178 mm) Must follow the Start Code command within it is own separate data stream.
EXAMPLE	<ESC>A <ESC>**EX0** <ESC>Z <ESC>**A** <ESC>H0050<ESC>V0100<ESC>WB1EXPAND TO: <ESC>H0050<ESC>V2700<ESC>WB1MAX INCHES <ESC>Q1 <ESC>Z <ESC>**A** <ESC>**AR** <ESC>Z
OUTPUT	(4-43) 
NOTES	"EX0" is effective until "AR" is sent to reset the printer to its standard print length, or until the printer is re-powered. When this command is used with the Store Form Overlay (<ESC>&) command the form length cannot exceed the maximum specified. If a job contains elements out of the memory range, it is ignored. If the Forms Overlay (<ESC>&) command is used with Expanded Memory to expand the print area, the Form Overlay length is still limited to the maximum.

GRAPHIC COMMANDS

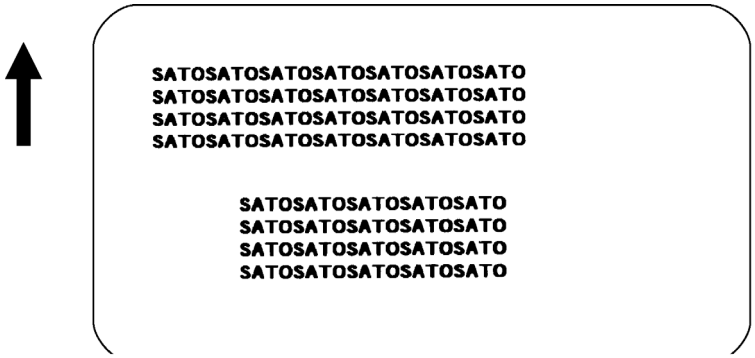
GRAPHICS, CUSTOM

FUNCTION	To create and print custom graphics (logos, pictures, etc.) on a label.
FORMAT	<ESC>**Gabbbccc(data)** a = Specifies format of data stream to follow B Binary format H Hexadecimal format bbb = Number of horizontal 8 x 8 blocks ccc = Number of vertical 8 x 8 blocks (data) = Hex data to describe the graphic image Place anywhere within the data stream after the necessary position commands.
EXAMPLE	<ESC>A <ESC>H0100<ESC>V0100<ESC>**GH006006** FFFFFFFFFFFFFFFFFFFFFFFFC00000000003 C00000000003C000FFFFFFF3C00080000013 C00080000013C0009FFFFF13C00080000013 C00080000013C0009FFFFF13C00080000013 C00080000013C000FFFFFFF3C00000000003 C00000000003C00000000003C00000000003 C00000000003C00000000003C00003C00003 C00007E00003C0000FF00003C0000FF00003 C0000FF00003C0000FF00003C00007E00003 C00003C00003C00003C00003C00003C00003 C00003C00003C00003C00003C00003C00003 C00003C00003C00003C00003C00003C00003 C00003C00003C00001800003C00000000003 C00000000003FFFFFFFFFFFFFFFFFFFFFFFF <ESC>H0300<ESC>V0100<ESC>XSPLEASE PLACE YOUR DISK <ESC>H0300<ESC>V0150<ESC>XSIN A SAFE PLACE <ESC>Q1<ESC>Z
OUTPUT	(4-52)
NOTES	Graphic images may be printed along with other data to enhance label appearance or eliminate the need for preprinted label stock. Using a dot-addressable matrix, design the graphic image in 8 x 8 dot blocks, then send it in a binary format to the printer. Do not use <ESC>CR or <ESC>LF characters as line delimiters within graphic data or the actual image will not be printed as specified. A custom graphic cannot be enlarged by the Character Expansion <ESC>L command and is not affected by either of the Rotation commands. Always design the graphic image in the appropriate orientation.

GRAPHICS, BMP FILE	
FUNCTION	To allow the creation and printing of graphic images using a BMP file format.
FORMAT	<ESC>**GMaaaaa,(data)** aaaaa = Number of bytes to be downloaded Place anywhere within the job data stream.
EXAMPLE	<ESC>A <ESC>V0100<ESC>H0100<ESC>**GM03800,(...Data...)** <ESC>Q1 <ESC>Z
OUTPUT	(4-53) 
NOTES	The maximum number of bytes that can be downloaded is 32K (compressed) and includes the BMP header information. The maximum size of the uncompressed BMP file is 64K. If the uncompressed file exceeds 64K, the graphic will not print. Only black and white BMP files can be downloaded. The file size specified by this command is the DOS file size in bytes.

GRAPHICS, PCX FILE	
FUNCTION	To allow the creation and printing of graphic images using a PCX file format.
FORMAT	<ESC>**GPaaaaa**,(data) aaaaa = Number of bytes to be downloaded Place anywhere within the job data stream.
EXAMPLE	<ESC>A <ESC>V0150<ESC>H0100<ESC>**GP03800,(...Data...)** <ESC>Q1 <ESC>Z
OUTPUT	(4-54) 
NOTES	The maximum number of bytes that can be downloaded is 32K (compressed). The number specified by this command includes the PCX header information. The maximum size of the uncompressed PCX file is 64K. If the uncompressed file exceeds 64K, the graphic will not print. Only black and white PCX files can be downloaded. The file size specified by this command is the DOS file size in bytes.

COPY IMAGE AREA

FUNCTION	To copy an image from one location to another on the same label. This may be useful for duplicating individual fields or entire sections of the label with only one command.
FORMAT	<ESC>**WDHaaaaVbbbbXccccYdddd** aaaa = Horizontal position of the top left corner of the area bbbb = Vertical position of the top left corner of the area cccc = Horizontal length of the image area to be copied dddd = Vertical length of the image area to be copied Place anywhere within the data stream, after specifying the location of the duplicate image.
EXAMPLE	<ESC>A <ESC>H0050<ESC>V0050<ESC>E010<ESC>XM SATOSATOSATOSATOSATOSATOSATO SATOSATOSATOSATOSATOSATOSATO SATOSATOSATOSATOSATOSATOSATO SATOSATOSATOSATOSATOSATOSATO <ESC>H0180<ESC>V0250<ESC>**WDH0130V0050X0400Y0200** <ESC>Q1 <ESC>Z
OUTPUT	(4-55) 
NOTES	Use Print Position commands (<ESC>V and <ESC>H) to locate the new area for the duplicate image. The position of the new target area must not be inside the original image. If using the Rotate command; the V, H, X and Y axis will be reversed. If the reference area of the target image exceeds the print area, it will not be printed. Refer to Programming Concepts of this manual for the values of Hmax and Vmax.

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5

OPTIONAL COMMAND CODES

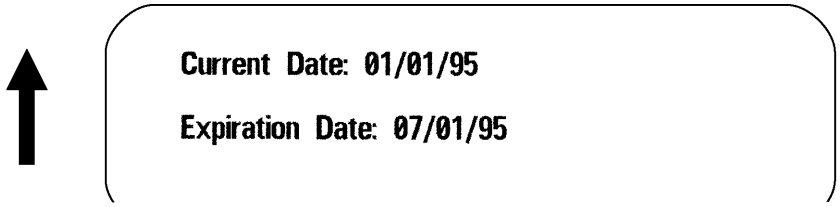
- **Calendar Commands**
- **Memory Card Commands**

CALENDAR COMMANDS

CALENDAR PRINTING

FUNCTION	Prints the date and/or time field from the printer's internal clock.
FORMAT	<ESC>**WA(elements)** Elements = YYYY: 4 digit (1981 to 2080) YY: 2 digit (00 to 91) MM: Month (01 to 12) DD Day (01 to 31) HH: 12 Hour clock (00 to 11) hh: 24 Hour clock (00 to 23) mm: Minute (00 to 59) ss: Seconds (00 to 59) TT: AM or PM JJJ: Julian Date (001 to 366) WW: Week (00 to 53) ww: Week (01 to 54) Place anywhere within the data stream.
EXAMPLE	<ESC>A <ESC>H0100<ESC>V0100<ESC>XB1The current date is: <ESC>XB1<ESC>**WAMM/DD/YY** <ESC>H0100<ESC>V0200<ESC>XB1The current time is: <ESC>XB1<ESC>WAhh:mm <ESC>Q1<ESC>Z
OUTPUT	There is not a printer output as a result of this command.
NOTES	The date and time elements may be placed in any order for printing. Use slash (/) to separate date elements and colon (:) to separate time elements. Up to 16 characters are allowed. The font must be specified prior. The printer's internal clock may be set through the Calendar Set command. This command may be used up to six times per job. The Copy (<ESC>WD), Mirror Image (<ESC>RM) or Reverse Image (<ESC>/) commands cannot be used with this command. Century ranges are: for year = YY, any year equal to or greater than 80 and less than or equal to 99, then the century equals 19 for year specified as YYYY=1999, and printed as <ESC>WAYY, will be equal to 99. The Julian date is the accumulated day from January 1st to the current date. The first day of the year is January 1st (001) and the last day of the year is December 31st (365 or 366 for leap years). The TT command should not be specified for printing in numeric only barcodes.

CALENDAR INCREMENT

FUNCTION	Prints the date and/or time field from the printer's internal clock.
FORMAT	<ESC>**WPabbb** a = Y: Years M: Months D: Days h: Hours W: Week number Place anywhere within the data stream.
EXAMPLE	<ESC>A <ESC>H0100<ESC>V0100<ESC>XB1Current Date: <ESC>WAMM/DD/YY <ESC>**WPM06** <ESC>H0100<ESC>V0200<ESC>XB1Expiration Date: <ESC>WAMM/DD/YY <ESC>Q1<ESC>Z
OUTPUT	(5-1) 
NOTES	Once the year increments past "99" it will wrap back to "00". This command can only be used once per data stream. The printer's internal clock may be set through the Calendar Set command. If a print quantity of more than one label per job is used, the same time and date will be on each label of the entire print job. Calendar Increment Example: 1998 January 15 (ww=03) plus 48 weeks = week 51. The Week Calendar specification follows ISO8601. Days of the week are numbered 1 through 7, beginning with Monday. The first week of the year is the week containing the first Thursday. If January 1st falls on Friday, it belongs to the last week of the previous year. If December 31st falls on a Wednesday, it belongs to the first week of the following year. If Calendar Increment calculation extends over the year, the result belongs to the week number of the following year.

CALENDAR CONFIGURATION	
FUNCTION	To set the time and date of the printer's internal clock.
FORMAT	<ESC>**WTaabbccddee** aa = Year (00 to 99) bb = Month (01 to 12) cc = Day (01 to 31) dd = Hour (00 to 23) ee = Minute (00 to 59) Place anywhere within the data stream.
EXAMPLE	<ESC>A <ESC>**WT9312251300** <ESC>Z
OUTPUT	There is not a printer output as a result of this command.
NOTES	Once the year increments past "99" it will wrap back to "00". This command can only be used once per data stream. The printer's internal clock may be set through the Calendar Set command. If a print quantity of more than one label per job is used, the same time and date will be on each label of the entire print job. Calendar Increment Example: 1998 January 15 (ww=03) plus 48 weeks = week 51. The Week Calendar specification follows ISO8601. Days of the week are numbered 1 through 7, beginning with Monday. The first week of the year is the week containing the first Thursday. If January 1st falls on Friday, it belongs to the last week of the previous year. If December 31st falls on a Wednesday, it belongs to the first week of the following year. If Calendar Increment calculation extends over the year, the result belongs to the week number of the following year.

MEMORY CARD COMMANDS

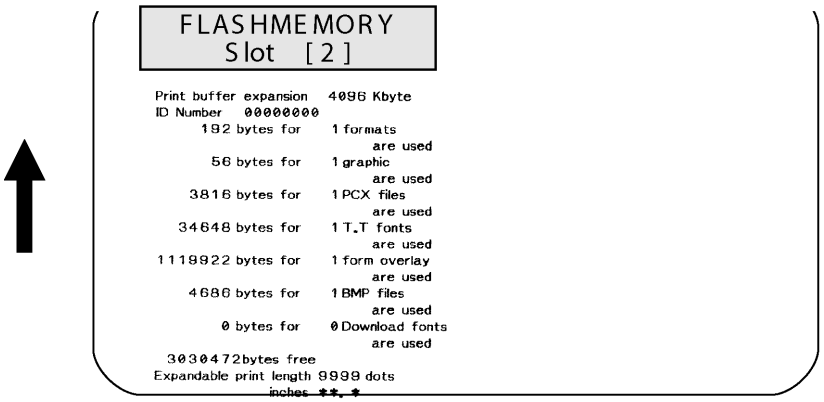
CARD SLOT FOR USE	
FUNCTION	Specifies the card slot for use.
FORMAT	<ESC>**CCa** a = Slot number Place immediately following <ESC>A.
EXAMPLE	<ESC>A <ESC>**CC1** <ESC>Z
OUTPUT	There is not a printer output as a result of this command.
NOTES	Specify this command for memory card function. When the card is not inserted, a card error will occur.
GL SPECIFIC DATA	For the GL4xxe architecture, the command parameter can be 1 or 2. The value refers to either the Memory Cartridge or the Flash memory on the main PCB. This is assigned in USER MODE via the printer's operation panel LCD. In USER MODE, the menu item "Mem Select (CC1)" can be used to define the numbers 1 and 2 to the memory cartridge and flash memory interchangeably. So, if the memory cartridge has been assigned the value of 1, a <ESC>CC1 sequence will be defining the memory cartridge as the card slot to be used for subsequent data storage. If the flash memory was assigned a value of 1 instead, then a <ESC>CC1 sequence will be defining the flash memory as the memory to be used for subsequent data storage.

CARD FORMAT	
FUNCTION	Specifies the format (initialization) of memory card.
FORMAT	<ESC>**BJFa** a = User ID (up to 8 bytes of alphanumerics and symbols) Place anywhere between <ESC>A and <ESC>Z.
EXAMPLE	<ESC>A <ESC>CC1 <ESC>**BJFsatocard** <ESC>Z
OUTPUT	There is not a printer output as a result of this command.
NOTES	This command is not valid without an optional memory card. Specify the Card Slot for Use <CC> prior to using this command. This command is for formatting a memory card and cannot be used in combination with other commands. If formatting the card by accident, registered data will be erased.

MEMORY CARTRIDGE FORMAT	
FUNCTION	To format the memory cartridge.
FORMAT	<ESC>**FMaaaaaaaa** a = "User ID" [Up to 8 bytes of alphanumeric and symbol (omissible)]
EXAMPLE	<ESC>A <ESC>CC1<ESC>**FMSATO** <ESC>Z
NOTES	Specify slot No. with Card Slot for Use<CC>prior to this command. This command cannot be used in combination with other commands. if formatting the card by accident, registered data will be erased. We are not liable for any damages or loss from such an occurrence. Printer needs to do "Optimize&Reboot" under "ADVANCED" after formatting.

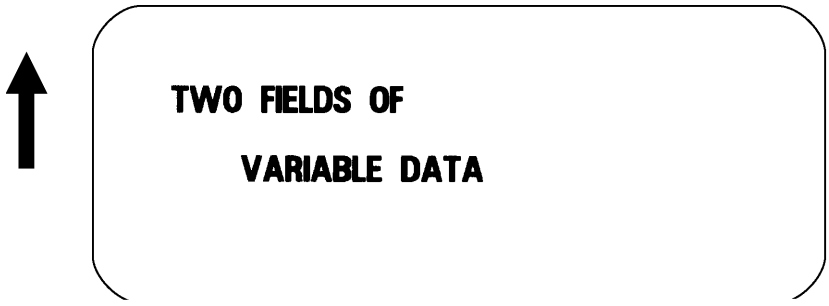
MEMORY CARTRIDGE PRINTING	
FUNCTION	To start printing from memory cartridge.
FORMAT	<ESC>**FP**
EXAMPLE	<ESC>A <ESC>CC1<ESC>**FP** <ESC>Z
NOTES	This command cannot be used in combination with other commands. It will be printed by width 100mm and pitch 100mm.

MEMORY CARD CLEAR	
FUNCTION	Clears the entire contents in the optional memory card.
FORMAT	<ESC>***a** a = Item to be cleared G: SATO Graphic P: PCX File M: BMP File F: Format O: True Type Font R: Form Overlay b = Registration number 000 to 999 True Type Font 001 to 999 Except True Type Font Place anywhere between <ESC>A and <ESC>Z.
EXAMPLE	<ESC>A <ESC>***G** <ESC>Z
OUTPUT	There is not a printer output as a result of this command.
NOTES	Begin Start of Data Transmission <A> and End of Data Transmission <Z> with this command. Specify the Card Slot for Use <CC> prior to using this command. To clear all data of the memory card, use Card Format <BJF>.

PRINT MEMORY CARD STATUS	
FUNCTION	Prints the status of memory card.
FORMAT	<ESC>**BJS** Place anywhere between <ESC>A and <ESC>Z.
EXAMPLE	<ESC>A <ESC>**BJS** <ESC>Z
OUTPUT	(5-2) 
NOTES	This command is for printing the memory card status and cannot be used in combination with other commands. The status can be checked with the label of W68mm and H90mm.

TRUE TYPE FONT, RECALL	
FUNCTION	Specifies to invoke True Type Font.
FORMAT	<ESC>**BJTa,aa,bb,cc,dd,ee,ffff,gg...g** a = Font ID (00 to 99) b = Horizontal magnification (01 to 12) c = Vertical Magnification (01 to 12) d = Character Pitch (01 to 99) e = Backup (00 fixed) f = Print Character Quantity (0000 to 9999) g = Data Place anywhere between <ESC>A and <ESC>Z.
EXAMPLE	<ESC>A <ESC>H0100<ESC>V0100<ESC>**BJT,01,02,02,01,00,0004SATO** <ESC>Q1 <ESC>Z
OUTPUT	(5-3)
NOTES	This command is not valid without an optional memory card. Specify the Card Slot for Use <CC> prior to using this command.

TRUE TYPE FONT, STORE	
FUNCTION	Specifies the storageTrue Type Font.
FORMAT	Begin download <ESC>**BJ(aa...abb..b** Download <ESC>**BJDccccddddee...e** End download <ESC>**BJ** a = Font Description (specification of 40 bytes of font) b = Date (10 bytes of date data) c = Memory Offset (5 bytes of memory offset in hex) d = Quantity of Data bytes (0001 to 2000) e = Font data to download (0001 to 2000) Place anywhere between <ESC>A and <ESC>Z.
OUTPUT	There is not a printer output as a result of this command.
NOTES	This command is not valid without an optional memory card. Specify the Card Slot for Use <CC> prior to using this command.

FORMAT/FIELD, RECALL	
FUNCTION	To recall a field from a stored format and place new data in the field.
FORMAT	<ESC>**YR,aa<ESC>/D,bb,cc....c** aa = Format number to be recalled (01 to 99) bb = Field number to be recalled (01 to 99) cc...c = Data to placed in the recalled field Place immediately following the <ESC>CC Slot Select command.
EXAMPLE	<ESC>A <ESC>CC1 <ESC>**YR,02<ESC>/D,01,TWO FIELDS OF <ESC>/D,02,VARIABLE DATA** <ESC>Q1<ESC>Z
OUTPUT	(5-4) 
NOTES	This command requires the Expanded Memory option. Only one format can be recalled at a time. However, multiple fields can be recalled from the same format. The number of data characters contained in the “cc...c” field cannot exceed the value designated in the <ESC>/N Field Store command. If it does, the data will be truncated to fit the field length defined in the store command.

FORMAT/FIELD, STORE	
FUNCTION	To store a format field description in the memory card.
FORMAT	<ESC>**YS,aa<ESC>/N,bb,cc....c** aa = Format number to be stored(01 to 99) bb = Field number to be stored (01 to 99) cc...c = Field length to be stored (01 to 99) Place immediately following the <ESC>CC Memory Area Select command.
EXAMPLE	<ESC>A <ESC>CC1 <ESC>**YS,02<ESC>/N,01,13<ESC>V0100<ESC>H0100<ESC>XB1** <ESC>/N,02,13<ESC>V0200<ESC>H0200<ESC>XB1 <ESC>Z
OUTPUT	There is no printer output as a result of this command. See <ESC>YR Format/Field Recall command.
NOTES	This command requires the Expanded Memory option. When storing multiple formats, enter <ESC>A and <ESC>Z with one format. Specify the Car Slot fo Use <ESC>CC prior to using this command. Use Field Store <ESC>/N in conjunction with this command. Attempts to store using a predefined field number will result in an error and the targeted content will be printed. **Refer to Appendix: Tables 34, 35, & 39 for additional information.**

FORM OVERLAY, RECALL	
FUNCTION	To recall the label image from stored in the Expanded Memory.
FORMAT	<ESC>**&R,aa** aa = Storage number (01 to 99) Place immediately following the <ESC>CC Memory Area Select command.
EXAMPLE	<ESC>A <ESC>CC1 <ESC>**&R,01** <ESC>Q1<ESC>Z
OUTPUT	There is not a printer output as a result of this command.
NOTES	The Expanded Memory option is required fro this command. The <ESC>CC Memory Area Select command must be sent prior to this command. Several images stored under different storage numbers can be printed with this command. The storage number must be speciifed. A read/write error will occur if an unused storage number is specified. The label image can be moved by using the <ESC>V and <ESC>H commands when it is stored along with a window size. If it exceeds the printable area by being moved, the label image will be trancated. **Refer to Appendix, Table 36 for additional information.**

FORM OVERLAY, STORE

FUNCTION	To store fixed print contents to the memory card.
FORMAT	<ESC>**&S,aa,bbbb,cccc** aa = Store number (01 to 99) bbbb = Horizontal size of window (50 to H max) cccc = Vertical size of window (50 to V max) Place immediately following the <ESC>CC Memory Area Select command.
EXAMPLE	<ESC>A <ESC>CC1 <ESC>**&S,01** <ESC>Z
OUTPUT	There is not a printer output as a result of this command.
NOTES	The Memory Area Select (<ESC>CC) command must be sent prior to this command. The label image must be divided from other label images by the <ESC>A and <ESC>Z bounding commands. The parameters of “bbbb” and “cccc” may be omitted. By specifying them, the label image can be moved by using the <ESC>V and <ESC>H position commands when recalling the label image. If the repositioned label image exceeds beyond the printable area, the image wil be truncated. If an <ESC>A1 Media Size command has been sent to the printer, the maximum size that can be stored is the size of the label defined in the command. A label image cannot be stored in a location that already contains data. Graphics, PCX and BMP files can be stored but their combined size cannot exceed memory. The forms stored by this command are cleared by the <ESC>*R command. **Refer to Appendix: Tables 37 & 38 for additional information.**

Figure for Example A

(5-5)

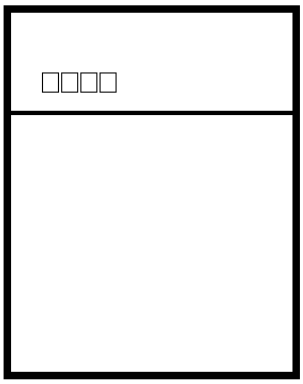


Figure for Example B

FORM OVERLAY, STORE

Example A: Normal Operation

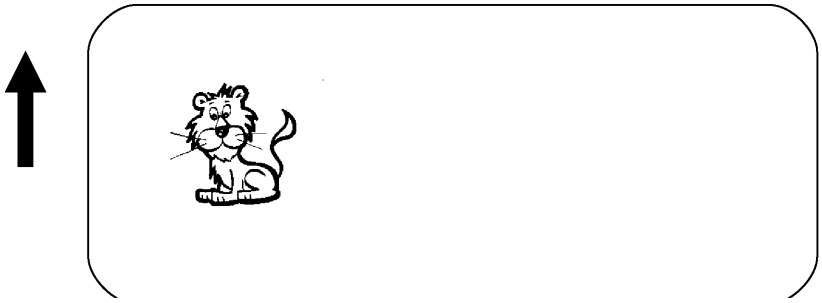
<ESC>A
<ESC>V100<ESC>H100<ESC>P2<ESC>L0202
<ESC>XMABCD
<ESC>V60<ESC>H60
<ESC>FW0808V800H400
<ESC>V320<ESC>H60
<ESC>FW04H400
<ESC>CC1
<ESC>**&S1**
<ESC>Z

Example B: When window size is specified

<ESC>A
<ESC>A1800400
<ESC><ESC>V100<ESC>H00<ESC>P2<ESC>L0202
<ESC>XMABCD
<ESC>CC1
<ESC>**&S, 1, 20, 200**
<ESC>Z

Example C: When print is specified after <ESC>&S

<ESC>A
<ESC>V100<ESC>H100<ESC>P2<ESC>L0202
<ESC>XMABCD
<ESC>V60<ESC>H60
<ESC>FW0808V800H400
<ESC>V320<ESC>H60
<ESC>FW04H400
<ESC>CC1
<ESC>**&S1**
<ESC>V200<ESC>H100<ESC>OB12345
<ESC>Z

BMP FILE, RECALL	
FUNCTION	To recall a previously stored BMP file stored in Expanded Memory.
FORMAT	<ESC>**GCaaa** aaa = Storage number (001 to 999) Place after the CC Memory Area Select command.
EXAMPLE	<ESC>A <ESC>CC1<ESC>V100<ESC>H100 <ESC>**GC001** <ESC>Q1<ESC>Z
OUTPUT	(5-6) 
NOTES	The <ESC>CC Memory Area Select command must be sent before this command. The printed image can be expanded or rotated.

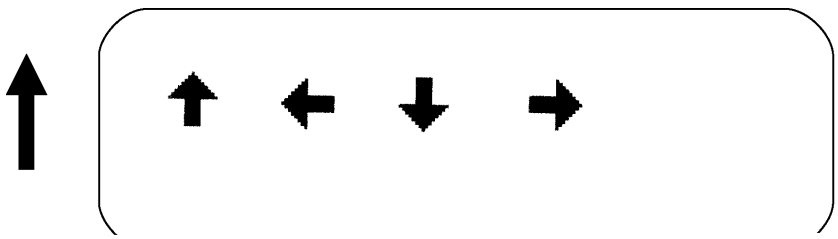
BMP FILE, STORE	
FUNCTION	To store for printing a graphic file in a BMP format in the optional Expanded Memory.
FORMAT	<ESC>**GTaaa,bbbbb,nn...n** aaa = Storage number (001 to 999) bbbbb = Size of BMP file in bytes nn..n+ = Data Place within its own data stream specifying the placement of the graphic.
EXAMPLE	<ESC>A <ESC>CC1<ESC>**GT001, 12345, nn...n** <ESC>Q1<ESC>Z
OUTPUT	There is no printer output as a result of this command.
NOTES	This command requires the Expanded Memory Option. See your SATO representative for details. Data must be sent in binary format. The Memory Area Select Command <ESC>CCa must be sent before this command. The first 62 bytes of the stored file is used for the header and the remainder is the BMP image data. The graphic will not be printed correctly if the specified size does not match the actual graphic size. Only black and white non-compressed BMP files can be stored. Color BMP files will cause an error. If you try to store an image in a memory area that already contains data, an error will occur.

PCX FILE, RECALL

FUNCTION	To recall for printing a graphic file previously stored in a PCX format in the Memory Card.
FORMAT	<ESC>**PY**aaa aaa = Storage number (001 to 999) This command must be placed within its own data stream specifying the placement of the graphic.
EXAMPLE	Normal Rotation <ESC>A<ESC>CC1 <ESC>V0100<ESC>H0050<ESC>**PY001** <ESC>Q1<ESC>Z Rotate Base Reference Point <ESC>A<ESC>CC1<ESC>**%1** <ESC>V0330<ESC>H0160<ESC>**PY001** <ESC>Q1<ESC>Z 2nd Rotation, Base Reference Point <ESC>A<ESC>CC1<ESC>**%2** <ESC>V0330<ESC>H0600<ESC>**PY001** <ESC>Q1<ESC>Z 3rd Rotation, Base Reference Point <ESC>A<ESC>CC1<ESC>**%3** <ESC>V0100<ESC>H0800<ESC>**PY001** <ESC>Q1<ESC>Z
OUTPUT	(5-7)
NOTES	This command requires Expanded Memory option. See your SATO representative for details. See the <ESC>PI Store PCX Graphics command.

PCX FILE, STORE	
FUNCTION	To store for later printing a PCX graphic file in the Expanded Memory.
FORMAT	<ESC>**Plaaa,bbbbb,**{data} aaa = Storage number (001 to 999) bbbbb = Size of PCX File in bytes. {data} = Data Place within its own data stream.
EXAMPLE	BASIC Program to download a PCX file to Expanded Memory Area 1, Storage Area 1 OPEN .C:\WIZARD\GRAPHICS\LION.PCX. FOR INPUT AS #2 DA$ = INPUT$(3800,#2) C$ = CHR$(27) WIDTH .LPT1:.,255 LPRINT C$;"A";C$;"CC1"; LPRINT C$; .**PI001,03800,.;DA$** LPRINT C$;"Z"; CLOSE #2
OUTPUT	There is no printer output as a result of this command. See <ESC>PY PCX Graphics Recall command.
NOTES	This command requires Expanded Memory option. See your SATO representative for details. Graphics cannot be stored as part of a format. Only black and white PCX files can be stored. The file size specified by this command is the DOS file size in bytes.

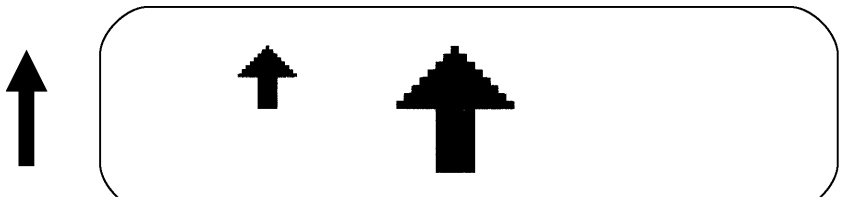
CUSTOM GRAPHICS, RECALL

FUNCTION	Use the Recall command any time you want to print a graphic image on a label along with other printed data.
FORMAT	<ESC>**GRaaa** aaa = Storage number (001 to 999) The Recall command is sent in a secondary data stream to print the graphic, and follows any necessary position or size commands.
EXAMPLE	Non Rotated Graphic <ESC>A<ESC>CC1 <ESC>V0100<ESC>H0080<ESC>L0505 <ESC>**GR001** <ESC>Q1<ESC>Z Graphic Rotated 90° <ESC>A<ESC>CC1<ESC>%1 <ESC>V0180<ESC>H0250<ESC>L0505 <ESC>**GR001** <ESC>Q1<ESC>Z Graphic Rotated 180° <ESC>A<ESC>CC1<ESC>%1 <ESC>V0180<ESC>H0500<ESC>L0505 <ESC>**GR001** <ESC>Q1<ESC>Z Graphic Rotated 270° **<**ESC>A<ESC>CC1<ESC>%3 <ESC>V0100<ESC>H0600<ESC>L0505 <ESC**>GR001** <ESC>Q1<ESC>Z
OUTPUT	(5-8) 
NOTES	The graphic image to be stored cannot be rotated before it is stored. It can be rotated when it is recalled. Graphic images cannot be stored as part of a label format. See the <ESC>GI Custom Graphic Store command.

CUSTOM GRAPHICS, STORE

FUNCTION	To provide similar functionality to the <ESC>G Custom Graphic command, but allows for the graphic image to be stored in Expanded Memory. Use the Store command to send the graphic data to the printer's optional Expanded Memory.
FORMAT	<ESC>**Glabbbcccddd{data}** aaa = Specifies character format of the data H: Hex data B: Binary data bbb = Number of horizontal 8 x 8 blocks (see Note 7 for range) ccc = Number of vertical 8 x 8 blocks (see Note 7 for range) ddd = Graphics storage number (001-099) {data} = Hex or binary data to describe the graphic image Immediately following the <ESC>CC Memory Area Select command.
EXAMPLE	<ESC>A <ESC>CC1 <ESC>**GIH00200200101000380 07C00FE01FF03FF87FFCFFFE07C007C007C007C007C007C007C007C0** <ESC>Z
OUTPUT	There is no printer output as a result of this command. See <ESC>GR Recall Custom Graphics command.
NOTES	Expanded Memory is required to use this command. Its maximum storage capacity is 999 graphics or up to the capacity of the memory card used. If a data transmission error occurs, the printer will beep, the ERROR LED will illuminate, and the image must be transmitted again. Each graphic to be stored must be sent in its own data stream. Example of correct data stream: <ESC>A <ESC>**GIHaaabbb001(DATA)** <ESC>Z <ESC>A <ESC>**GIHaaabbb002(DATA)** <ESC>Z Example of incorrect data stream: <ESC>A <ESC>**GIHaaabbb001(DATA)** <ESC>**GIHaaabbb002(DATA)** <ESC>Z Do not use ASCII <CR> or <LF> characters (carriage return or line feed) as line delimiters within the graphic data or the actual image will not be printed as specified.

CHARACTER, CUSTOM DESIGNED

FUNCTION	To allow for the creation, storage, and printing of custom characters, such as special fonts or logos. Up to 50 individual characters may be stored in the custom character volatile memory.
FORMAT	Store Command: <ESC>**Tabcc** Recall Command: <ESC>**Kab90cc** a = 1 16x16 matrix 2 24x24 matrix b = Specifies the character encoding method for the data stream H Hexadecimal characters B Binary characters cc = Memory location to store/recall the character. Valid memory locations are 21 to 52 (counting in Hex) or “!” or “R” in Binary. (data) = Data to describe the character The Store command is typically sent in its own data stream to the printer, between the Start/Stop commands. The Recall command is sent in a secondary data stream to print the character, and follows any necessary position or size commands.
EXAMPLE	<ESC>A <ESC>**T1H3F0100038007C00FE01FF03FF87FFCFFFE07C007C007C007C007C00** <ESC>Z <ESC>A <ESC>H150<ESC>V100<ESC>L0505<ESC>**K1H903F** <ESC>H350<ESC>V100<ESC>L1010<E SC>**K1H903F** <ESC>Q1 <ESC>Z
OUTPUT	(5-9) 
NOTES	When printing the custom character using the Recall command, the character is affected by the following commands: Character Expansion Character Pitch Line Feed Rotate, Fixed Base Reference Point The characters are stored in volatile memory and must be reloaded if the printer power is lost. Do not use ASCII <CR> or <LF> characters (carriage return or line feed) as line delimiters within the graphic data or the actual image will not be printed as specified.

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6

BI-DIRECTIONAL COMMUNICATIONS

- **Introduction**
- **Enquire & Response**

INTRODUCTION

Bi-Directional communications is a two-way communications protocol between the host and the printer enabling the host to monitor and control the printer's operational status. The Bi-Com 5 protocol only works in the Multi-Job Buffer mode.

GENERAL CONFIGURATION

Refer to Appendix: Reference Table 40 for printer configuration commands.

SERIAL INTERFACE

For this protocol to function properly with an RS232C Interface, pin 4 (DTR) and pin 8 (CTS) must be held high by the host. To ensure these pins are always in the correct state is to tie pin 4 (DTR) to pin 6 (DSR) and pin 7 (RTS) to pin 8 (CTS) at the printer end on the cable.

RECEIVE BUFFER

This protocol controls information such as reception, print, and cancellation for every item. When the buffer is near full, an error will occur informing the host that either there is not enough memory remaining or that the item quantity has been exhausted.

To release the receive buffer one of those conditions must be remedied.

DATA TRANSMISSION

Data transmissions must be preceded with STX (HEX 02H) and be followed by ETX (HEX 03H) to function.The string must also include the item number or an error will occur. An error will also occur if an incorrect item number is identified. BCC must follow <ESC>Z if the BCC function is enabled.

Print Data

<STX><ESC>A<ESC>{ID 00000}{Print Data}<ESC>Z<ESC>BCC<ETX>

Status Request

<STX>SOH{ENQ}00000<ETX>

ENQUIRE & RESPONSE

ENQUIRE (SOH + ENQ)

Upon receipt of an ENQ command, the printer responds with status information bounded by an STX/ETX pair. The status information is defined as follows:

<STX>{ # Byte ID }{ # Status Byte }{ # Byte Label Remaining }{ # Byte Job Name }<ETX>

ID	Identifies the current print job ID. Is defined using the Job ID (<ESC>ID) command transmitted with the print job.
Status	Defines the current status of the printer.
Label Remaining	Defines the quantity of labels remaining in the current print job.
Job Name	ASCII characters identify the assigned job name by the Job Name (<ESC>WK) command. If the name is less than the required characters, the field will be padded with zeroes.

If an ENQ is received after the print job specified in the ID bytes has been completed, or the buffer is empty of data, the printer will respond with “space” characters for the ID number (Remaining Labels & Job Name bytes).

The host computer transmits an ENQ to the printer which responds within five milliseconds unless actively printing. If printing, it will respond upon finishing and then resume printing.

Refer to Appendix: Reference Tables 41 and 42 for additional information.

RETURN STATUS BYTES & FORMAT						
1	**5**	**2**	**5**	**2**	**6**	**1**
STX	Item Number	Item Status	Item Number in Process	Item Status in Process	Issues of Item in Process	ETX

CANCEL (SOH + CAN)

If a CAN command is received, it will stop the print job and clear all data from the buffers. A delay of five milliseconds is required before any new data may be downloaded. The CAN command is effective upon receipt, even if the printer is offline or in an error condition. The printer will return an ACK if the printer is not in an error condition and a NAK if an error condition exists.

PRINT JOB

Upon receipt of a valid print job (<ESC>A....<ESC>Z), an ACK will be returned by the printer if an error condition does not exist and a NAK if an error condition exists.

PRINT STOP (SOH + DLE)

This command stops the printing process and the host sends an ENQ command to confirm execution. Execution should be avoided while sending print or other data. If an error condition occurs, a NAK is returned and an ACK is returned if one does not.

PRINT START (SOH + DC1)

This command enables the printer to exit the pause mode by the request command to resume printing. The host also sends an ENQ command to confirm execution. Execution should be avoided while sending print or other data. Upon receipt of this command, an ACK is returned if an error condition does not exist and a NAK if one does.

OBTAIN HISTORY DATA (SOH + LW)

This command enables the printer to send 500-items at a time of CR/LF history data to the host. Avoid any transmission to the printer while history data is being sent to the host. Also avoid the inclusion and use of this command in the print data.

When the Item Number command is not in the receive data, or the command is incorrect, the item number is saved as "*****" and the status as "3" in the history. The Item Number Error may occur at the beginning of print operation and cease operation.

HISTORY DATA		
ITEM	**DESRCIPTION**	**BYTES**
1	Management Flag	1
2	Item Number	5
3	Status 00: Received 01: Issued 02: Cancel 03: Item Number Error 04: BCC Error 05: Designation of Print after Occurrence 06: Cancel after Error Occurrence 07: Analyzing Unprinted Items 08: Unprocessed Error due to Power Removal	2

RETURN HISTORY DATA BYTES & FORMAT							
1	**5**	**2**	**2**		**5**	**2**	**1**
STX	Item Number	Item Status	CR/LF		Item Number	Item status	ETX

RELEASE RETURN ERROR (SOH + SUB)

This command enables the printer to release from an error and resume printing of the item where the error occurred. The host also sends an ENQ command to confirm execution. Avoid the inclusion and use of this command in the print data.

PRINTER STATUS (SOH + MG)

Receipt of SOH followed by MG causes the printer to return information bounded by an STX-ETX pair that reports the current operating status of the printer.

COUNTER STATUS (SOH + ME)
Receipt of SOH followed by ME causes the printer to return information bounded by an STX-ETX pair that reports the operating status of the printer's life counters.

SENSOR STATUS (SOH + SG)
Receipt of SOH followed by SG causes the printer to return information bounded by an STX-ETX pair that reports the current operating status of the printer's sensors. Refer to Appendix: Table

HEAD STATUS (SOH + HC)
Receipt of SOH followed by HC causes the printer to return information bounded by an STX-ETX pair that reports the current operating status of the print head.

SYSTEM VERSION INFORMATION (SOH + SB)
Receipt of SOH followed by SB causes the printer to return information bounded by an STX-ETX pair that reports the system version of the printer.

MEMORY STATUS (SOH + EB)
Receipt of SOH followed by EB causes the printer to return information bounded by an STX-ETX pair that reports the current user memory allocation.

FORM OVERLAY STATUS (SOH + FO)
Receipt of SOH followed by FO causes the printer to return information bounded by an STX-ETX pair that reports the forms downloaded into the printer.

FONT CONFIGURATION (SOH + FG)
Receipt of SOH followed by FG causes the printer to return information bounded by an STX-ETX pair that reports information on the stored font or graphic.

INTERFACE STATUS (SOH + IG)
Receipt of SOH followed by IG causes the printer to return information bounded by an STX-ETX pair that reports the type of interface connection currently set.

INTERFACE SETTINGS (SOH + H2)
Receipt of SOH followed by H2 causes the printer to return information bounded by an STX-ETX pair that reports the current operating parameters of the interface.

ITEM NUMBER CHECK

The printer checks the item number of received print data whether the number is increasing one (1) to every item. If an error is detected, the printer activates “ITEM NUMBER ERROR” at the beginning of that item’s print operation ceases printing. The item number error can only be detected if the Check of Item Number is enabled.

In addition to various printer keypad functions, a BCC error may be released by either sending a SUB command or a CAN command.

Specify the item number starting from “00000” after powering on the printer. Note that print data is the subject of the check of item number and that error detection is not performed for the data that does not accompany print operation - such as registered data and printer setup command. For such data, specify “*****” for its item number.

When specifying the item number with <ESC>IQ, the command for the designation of Start Item Number, the start number for the next data becomes the item number specified in <ESC>IQ.

BCC CHECK (BLOCK CHECK CODE)

The printer checks the accuracy of received data by calculating BCC based on the received data of every item and comparing such BBC to the other BBC that was sent. If both BCC do not match, the printer recognizes the received data as incorrect data, activates BCC ERROR at the start of the print operation of that item and then stops the operation.

When the host sends data to the printer, add BCC to the end of the data (<ESC>Z) at every item. A single byte data calculated XOR of one item (<ESC>A - <ESC>Z) of sent data is as BCC.

Note that print data is subject to the check of BCC. Error detection is not performed for the data that does not accompany print operation such as registered data and printer setup commands. BCC adds the data located between the start and end of data (<ESC>A - <ESC>Z).

In addition to various printer keypad functions, a BCC error may be released by either sending a SUB command or a CAN command.

DESIGNATION OF START ITEM NUMBER (ESC + IQ)

This command transmits the item number of the print data that is firstly sent by the host to the printer. The printer recognizes the value that added one (1) to the item number specified by this command as the item number of print data to be received afterward.

Avoid the inclusion and use of this command in the print data (<ESC>A - <ESC>Z). Note that five (5) digits are required and that when specifying “99999” the next item number will be “00000”.

DESIGNATION OF SWITCHING STATUS 5 RETURN (ESC + PL)

This command switching the communication protocol. Avoid the inclusion and use of this command in the print data (<ESC>A - <ESC>Z). The specified contents are still in effect after the printer is powered off.

This command is not available for the protocol that is not supported by the current interface. If using LAN interface or changing from driver protocol (or vice versa), repower on the printer. Normal transmission and reception of data cannot be performed without repowering.

PARAMETER (ESC + PL + a		
a	Switchover Designation -	0: Ready/Busy 1: Xon/Xoff 2: Status 2 Return 3: Status 3 Return 4: Driver Protocol 5: Status 5 Return

DESIGNATION OF STATUS 5 RETURN CHECK (ESC + CR)

This command provides setup of the BCC Check function of Status 5 Return and the item number. Avoid the inclusion and use of this command in the print data (<ESC>A - <ESC>Z).

PARAMETER (ESC + PL + a		
a	BCC Check -	0: Not Available 1: Available
b	Item Number Check -	0: Not Available 1: Available

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APPENDIX

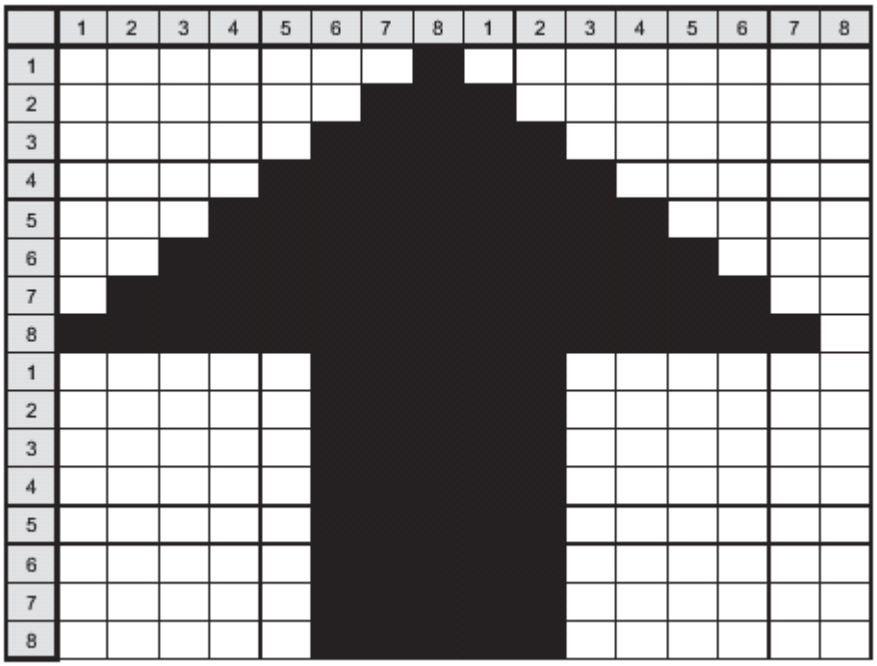
- **Custom Characters/Graphics**
- **Custom Protocol Codes**
- **Reference Tables**

CUSTOM CHARACTERS/GRAPHICS

CUSTOM DESIGNED CHARACTER EXAMPLE

The following example is presented to help understand the use of the Custom Designed Characters command. It demonstrates the design and printing of an “arrow” in a 16 x 16 matrix.

1. Determine which matrix size to use
   - 16 dot x 16 dots
   - 24 dots by 24 dots
2. Lay out a grid and draw the image on the grid.
   - Each square represents one dot
   - Blacken squares for each printed dot



3. Transfer the image into two bit map representations and then into hexadecimal or binary format.

ROW	BIT MAP				HEX	
1	0000	0001	0000	0000	01	00
2	0000	0011	1000	0000	03	80
3	0000	0111	1100	0000	07	C0
4	0000	1111	1110	0000	0F	E0
5	0001	1111	1111	0000	1F	F0
6	0011	1111	1111	1000	3F	F8
7	0111	1111	1111	1100	7F	FC
8	1111	1111	1111	1110	FF	FE
9	0000	0111	1100	0000	07	C0
10	0000	0111	1100	0000	07	C0
11	0000	0111	1100	0000	07	C0
12	0000	0111	1100	0000	07	C0
13	0000	0111	1100	0000	07	C0
14	0000	0111	1100	0000	07	C0
15	0000	0111	1100	0000	07	C0
16	0000	0111	1100	0000	07	C0

4. To store the custom designed character in memory using a hexadecimal data stream:

```
<ESC>A
<ESC>T1H3F0100038007C00FE01FF03FF87FFCFFFE07C007C007C007C007C007C007C007C0<ESC>Z
```

5. To recall a custom character from memory, send the following code to the printer. Note the character size was expanded using the <ESC>L command. Other data can also be printed.

```
<ESC>A
<ESC>L0505<ESC>H0150<ESC>V100<ESC>K1H903F
<ESC>L0505<ESC>H0600<ESC>V100<ESC>K1H903F
<ESC>L0303<ESC>H0125<ESC>V0250<ESC>MTHIS SIDE UP !
<ESC>Q1
<ESC>Z
```

6. To store the custom designed character in memory using a binary data stream:

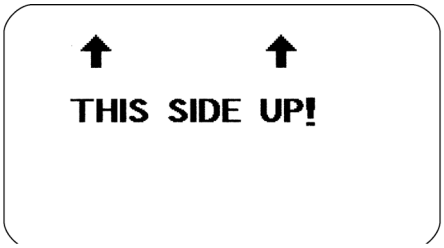
```
<ESC>A
<ESC>T1B3F 01H 00H 03H 80H 07H C0H 0FH E0H 1FH F0H 3FH F8H 7FH FCH FFH FEH 07H C0H 07H
C0H 07H C0H 07H C0H 07H C0H 07H C0H 07H C0H 07H C0H 07H C0H
<ESC>Z
```

> NOTE: The data stream is only half as long as the hexadecimal format because sending the binary equivalent of “11111111” (represented above in its hexadecimal value of FFH), for example, using one eight bit word while it takes two eight bit words to transmit the hexadecimal equivalent “F” and “F”. To send binary characters using BASIC, the expression ìCHR (&HFF) will send the binary equivalent of FF (i.e., 11111111).

7. To recall the custom character from memory, send the following code to the printer:

```
<ESC>A
<ESC>L505<ESC>H0150<ESC>V100<ESC>K1B903F
<ESC>L505<ESC>H0600<ESC>V100<ESC>K1B903F
<ESC>L0303<ESC>H0125<ESC>V0250<ESC>XMTHISSIDE UP !
<ESC>Q1
<ESC>Z
```

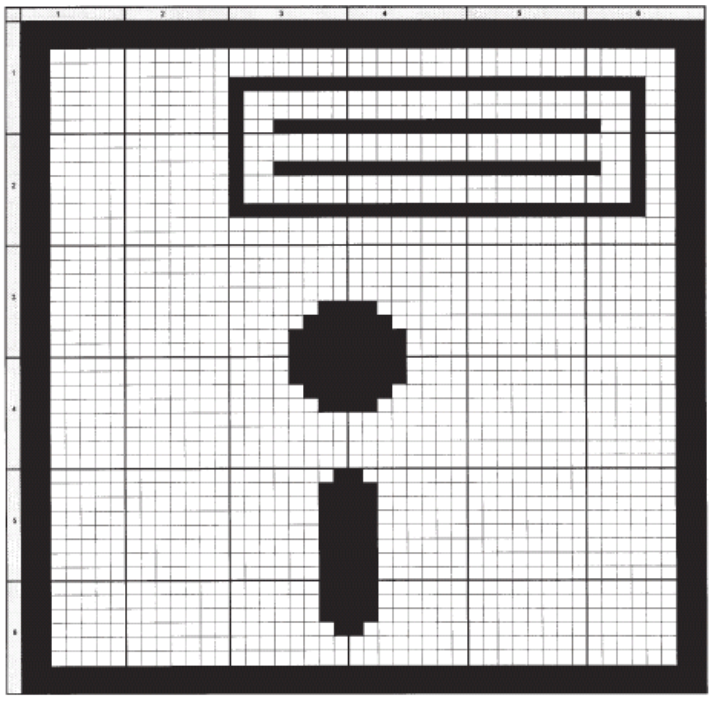
The printer output for both the hexadecimal and binary format examples is.



CUSTOM GRAPHICS EXAMPLE

The following example is presented to help you understand the use of the Custom Graphics command. It demonstrates the design and printing of a diskette in a 48 x 48 matrix.

1. Determine the matrix size for the graphic. It must be in 8 dot by 8 dot blocks. The example here has six blocks horizontally and six blocks vertically (48 x 48).
2. Lay out a grid and draw the image on the grid.
   - Each square represents one dot
   - Blacken squares for each printed dot



3. Transfer the image into a bit map representation and then into hexadecimal format:

BIT MAP						HEXADECIMAL FORMAT					
1	2	3	4	5	6	1	2	3	4	5	6
11111111	11111111	11111111	11111111	11111111	11111111FF	FF	FF	FF	FF	FF	FF
11111111	11111111	11111111	11111111	11111111	11111111FF	FF	FF	FF	FF	FF	FF
11000000	00000000	00000000	00000000	00000000	00000011C0	00	00	00	00	03	03
11000000	00000000	00000000	00000000	00000000	00000011C0	00	00	00	00	03	03
11000000	00000000	11111111	11111111	11111111	11110011C0	00	FF	FF	FF	03	03
11000000	00000000	10000000	00000000	00000000	00010011C0	00	80	00	00	13	13
11000000	00000000	10000000	00000000	00000000	00010011C0	00	80	00	00	13	13
11000000	00000000	10011111	11111111	11111111	00010011C0	00	9F	FF	FF	13	13
11000000	00000000	10000000	00000000	00000000	00010011C0	00	80	00	00	13	13
11000000	00000000	10000000	00000000	00000000	00010011C0	00	80	00	00	03	03
11000000	00000000	10011111	11111111	11111111	00010011C0	00	9F	FF	FF	13	13
11000000	00000000	10000000	00000000	00000000	00010011C0	00	80	00	00	13	13
11000000	00000000	10000000	00000000	00000000	00010011C0	00	80	00	00	13	13
11000000	00000000	11111111	11111111	11111111	11110011C0	00	FF	FF	FF	F3	F3
11000000	00000000	00000000	00000000	00000000	00000011C0	00	00	00	00	03	03
11000000	00000000	00000000	00000000	00000000	00000011C0	00	00	00	00	03	03
11000000	00000000	00000000	00000000	00000000	00000011C0	00	00	00	00	13	13
11000000	00000000	00000000	00000000	00000000	00000011C0	00	00	00	00	13	13
11000000	00000000	00000000	00000000	00000000	00000011C0	00	00	00	00	13	13
11000000	00000000	00000000	00000000	00000000	00000011C0	00	00	00	00	13	13
11000000	00000000	00000011	11000000	00000000	00000011C0	00	03	C0	00	03	03
11000000	00000000	00000111	11100000	00000000	00000011C0	00	07	E0	00	03	03
11000000	00000000	00001111	11110000	00000000	00000011C0	00	0F	F0	00	03	03
11000000	00000000	00001111	11110000	00000000	00000011C0	00	0F	F0	00	03	03
11000000	00000000	00001111	11110000	00000000	00000011C0	00	0F	F0	00	03	03
11000000	00000000	00001111	11110000	00000000	00000011C0	00	0F	F0	00	03	03
11000000	00000000	00000111	11100000	00000000	00000011C0	00	07	E0	00	03	03
11000000	00000000	00000011	11000000	00000000	00000011C0	00	03	C0	00	03	03
11000000	00000000	00000000	00000000	00000000	00000011C0	00	00	00	00	03	03
11000000	00000000	00000000	00000000	00000000	00000011C0	00	00	00	00	03	03
11000000	00000000	00000000	00000000	00000000	00000011C0	00	00	00	00	03	03
11000000	00000000	00000000	00000000	00000000	00000011C0	00	00	00	00	03	03
11000000	00000000	00000001	10000000	00000000	00000011C0	00	01	80	00	03	03
11000000	00000000	00000011	11000000	00000000	00000011C0	00	03	C0	00	03	03
11000000	00000000	00000011	11000000	00000000	00000011C0	00	03	C0	00	03	03
11000000	00000000	00000011	11000000	00000000	00000011C0	00	03	C0	00	03	03
11000000	00000000	00000011	11000000	00000000	00000011C0	00	03	C0	00	03	03
11000000	00000000	00000011	11000000	00000000	00000011C0	00	03	C0	00	03	03
11000000	00000000	00000011	11000000	00000000	00000011C0	00	03	C0	00	03	03
11000000	00000000	00000011	11000000	00000000	00000011C0	00	03	C0	00	03	03
11000000	00000000	00000011	11000000	00000000	00000011C0	00	03	C0	00	03	03
11000000	00000000	00000011	11000000	00000000	00000011C0	00	03	C0	00	03	03
11000000	00000000	00000001	10000000	00000000	00000011C0	00	01	80	00	03	03
11000000	00000000	00000000	00000000	00000000	00000011C0	00	03	C0	00	03	03
11000000	00000000	00000000	00000000	00000000	00000011C0	00	03	C0	00	03	03
11111111	11111111	11111111	11111111	11111111	11111111FF	FF	FF	FF	FF	FF	FF
11111111	11111111	11111111	11111111	11111111	11111111FF	FF	FF	FF	FF	FF	FF

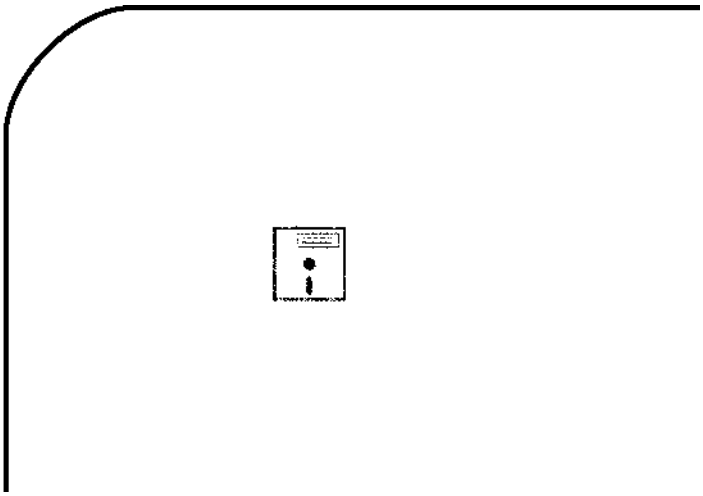
4. Using the hexadecimal data, send the following code to print the graphic image as designed.

```
<ESC>A<ESC>H0100<ESC>V0100<ESC>GH006006
FFFFFF FFFFFF FFFFFF FFFFFF C00000 000003
C00000 000003 C000FF FFFFF3 C00080 000013
C00080 000013 C0009F FFFF13 C00080 000013
C00080 000013 C0009F FFFF13 C00080 000013
C00080 000013 C000FF FFFFF3 C00000 000003
C00000 000003 C00000 000003 C00000 000003
C00000 000003 C00000 000003 C00003 C00003
C00007 E00003 C0000F F00003 C0000F F00003
C0000F F00003 C0000F F00003 C00007 E00003
C00003 C00003 C00000 000003 C00000 000003
C00000 000003 C00000 000003 C00001 800003
C00003 C00003 C00003 C00003 C00003 C00003
C00003 C00003 C00003 C00003 C00003 C00003
C00003 C00003 C00003 C00003 C00003 C00003
C00003 C00003 C00001 800003 C00000 000003
C00000 000003 FFFFFF FFFFFF FFFFFF FFFFFF
<ESC>Q1<ESC>Z
```

5. To send the data in binary format, the software must convert the data into binary format before transmitting it to the printer. Using the BASIC programming language for example, this is done by notation “CHR$ (&HC0)” which sends the hexidecimal value of “C0” as binary data (11000000). The BASIC program listing for sending this graphic to the printer (using the RS232 port) in binary format is:

```
CLS
OPEN .COM2:9600,N,8,1,CS,DS. FOR OUTPUT AS #1E$ = CHR$(27)
PRINT #1,CHR$(2); E$; .A.; E$; .V0100"; E$; .H0100"; E$; .GB006006";
PRINT #1,CHR$(&HFF);CHR$(&HFF);CHR$(&HFF);CHR$(&HFF);CHR$(&HFF);
PRINT #1,CHR$(&HFF);CHR$(&HFF);CHR$(&HFF);CHR$(&HFF);CHR$(&HFF);
PRINT #1,CHR$(&HFF);CHR$(&HFF);CHR$(&HC0);CHR$(&H00);CHR$(&H00);
PRINT #1,CHR$(&H00);CHR$(&H00);CHR$(&H03);CHR$(&HC0);CHR$(&H00);
PRINT #1,CHR$(&H00);CHR$(&H00);CHR$(&H00);CHR$(&H03);CHR$(&HC0);
PRINT #1,CHR$(&H00);CHR$(&HFF);CHR$(&HFF);CHR$(&HFF);CHR$(&HF3);
PRINT #1,CHR$(&HC0);CHR$(&H00);CHR$(&H80);CHR$(&H00);CHR$(&H00);
PRINT #1,CHR$(&H13);CHR$(&HC0);CHR$(&H00);CHR$(&H80);CHR$(&H00);
PRINT #1,CHR$(&H00);CHR$(&H13);CHR$(&HC0);CHR$(&H00);CHR$(&H9F);
PRINT #1,CHR$(&HFF);CHR$(&HFF);CHR$(&H13);CHR$(&HC0);CHR$(&H00);
PRINT #1,CHR$(&H80);CHR$(&H00);CHR$(&H00);CHR$(&H13);CHR$(&HC0);
PRINT #1,CHR$(&H00);CHR$(&H80);CHR$(&H00);CHR$(&H00);CHR$(&H13);
PRINT #1,CHR$(&HC0);CHR$(&H00);CHR$(&H9F);CHR$(&HFF);CHR$(&HFF);
PRINT #1,CHR$(&H13);CHR$(&HC0);CHR$(&H00);CHR$(&H80);CHR$(&H00);
PRINT #1,CHR$(&H00);CHR$(&H13);CHR$(&HC0);CHR$(&H00);CHR$(&H80);
PRINT #1,CHR$(&H00);CHR$(&H00);CHR$(&H13);CHR$(&HC0);CHR$(&H00);
PRI NT #1,CHR$(&HFF);CHR$(&HFF);CHR$(&HFF);CHR$(&HF3);CHR$(&HC0);
PRINT #1,CHR$(&H00);CHR$(&H00);CHR$(&H00);CHR$(&H00);CHR$(&H03);
PRINT #1,CHR$(&HC0);CHR$(&H00);CHR$(&H00);CHR$(&H00);CHR$(&H00);
PRINT #1,CHR$(&H03);CHR$(&HC0);CHR$(&H00);CHR$(&H00);CHR$(&H00);
PRINT #1,CHR$(&H00);CHR$(&H03);CHR$(&HC0);CHR$(&H00);CHR$(&H00);
PRINT #1,CHR$(&H00);CHR$(&H00);CHR$(&H03);CHR$(&HC0);CHR$(&H00);
PRINT #1,CHR$(&H00);CHR$(&H00);CHR$(&H00);CHR$(&H03);CHR$(&HC0);
PRINT #1,CHR$(&H00);CHR$(&H00);CHR$(&H00);CHR$(&H00);CHR$(&H03);
PRINT #1,CHR$(&HC0);CHR$(&H00);CHR$(&H03);CHR$(&HC0);CHR$(&H00);
PRINT #1,CHR$(&H03);CHR$(&HC0);CHR$(&H00);CHR$(&H07);CHR$(&H00);
PRINT #1,CHR$(&H00);CHR$(&H03);CHR$(&HC0);CHR$(&H00);CHR$(&H0F);
PRINT #1,CHR$(&HF0);CHR$(&H00);CHR$(&H03);CHR$(&HC0);CHR$(&H00);
PRINT #1,CHR$(&H0F);CHR$(&HF0);CHR$(&H00);CHR$(&H03);CHR$(&HC0);
PRINT #1,CHR$(&H00);CHR$(&H0F);CHR$(&HF0);CHR$(&H00);CHR$(&H03);
PRINT #1,CHR$(&HC0);CHR$(&H00);CHR$(&H0F);CHR$(&HF0);CHR$(&H00);
PRINT #1,CHR$(&H03);CHR$(&HC0);CHR$(&H00);CHR$(&H07);CHR$(&HE0);
PRINT #1,CHR$(&H00);CHR$(&H03);CHR$(&HC0);CHR$(&H00);CHR$(&H03);
PRINT #1,CHR$(&HC0);CHR$(&H00);CHR$(&H03);CHR$(&HC0);CHR$(&H00);
PRINT #1,CHR$(&H00);CHR$(&H00);CHR$(&H00);CHR$(&H03);CHR$(&HC0);
PRINT #1,CHR$(&H00);CHR$(&H00);CHR$(&H00);CHR$(&H00);CHR$(&H03);
PRINT #1,CHR$(&HC0);CHR$(&H00);CHR$(&H00);CHR$(&H00);CHR$(&H00);
PRINT #1,CHR$(&H03);CHR$(&HC0);CHR$(&H00);CHR$(&H00);CHR$(&H00);
PRINT #1,CHR$(&H00);CHR$(&H03);CHR$(&HC0);CHR$(&H00);CHR$(&H01);
PRINT #1,CHR$(&H80);CHR$(&H00);CHR$(&H03);CHR$(&HC0);CHR$(&H00);
PRINT #1,CHR$(&H03);CHR$(&HC0);CHR$(&H00);CHR$(&H03);CHR$(&HC0);
PRINT #1,CHR$(&H00);CHR$(&H03);CHR$(&HC0);CHR$(&H00);CHR$(&H03);
PRINT #1,CHR$(&HC0);CHR$(&H00);CHR$(&H03);CHR$(&HC0);CHR$(&H00);
PRINT #1,CHR$(&H03);CHR$(&HC0);CHR$(&H00);CHR$(&H03);CHR$(&HC0);
PRINT #1,CHR$(&H00);CHR$(&H03);CHR$(&HC0);CHR$(&H00);CHR$(&H03);
PRINT #1,CHR$(&HC0);CHR$(&H00);CHR$(&H03);CHR$(&HC0);CHR$(&H00);
PRINT #1,CHR$(&H03);CHR$(&HC0);CHR$(&H00);CHR$(&H03);CHR$(&HC0);
PRINT #1,CHR$(&H00);CHR$(&H03);CHR$(&HC0);CHR$(&H00);CHR$(&H03);
PRINT #1,CHR$(&HC0);CHR$(&H00);CHR$(&H03);CHR$(&HC0);CHR$(&H00);
PRINT #1,CHR$(&H01);CHR$(&H80);CHR$(&H00);CHR$(&H03);CHR$(&HC0);
PRI NT #1,CHR$(&H00);CHR$(&H00);CHR$(&H00);CHR$(&H00);CHR$(&H03);
PRINT #1,CHR$(&HC0);CHR$(&H00);CHR$(&H00);CHR$(&H00);CHR$(&H00);
PRINT #1,CHR$(&H03);CHR$(&HFF);CHR$(&HFF);CHR$(&HFF);CHR$(&HFF);
PRINT #1,CHR$(&HFF);CHR$(&HFF);CHR$(&HFF);CHR$(&HFF);CHR$(&HFF);
PRINT #1,CHR$(&HFF);CHR$(&HFF);CHR$(&HFF);
PRINT #1,E$; .Q1"; E$; .Z"; CHR$(3)
CLOSE #1
```

The printer output for both the hexadecimal and binary format example is:



PCX GRAPHICS EXAMPLE

A graphics file in a PCX format may also be transmitted to the printer. The file must not be larger than 32K bytes (DOS file size reported in a DIR listing). For example, the WIZ.PCX image shown below has a file size of 15076 bytes.

The uncompressed size (PCX is a compressed file) of the file must not be greater than 64K bytes. Generally this is not a problem unless the graphic image is surrounded by large amount of white space which the PCX algorithm can compress very efficiently. If this is the case, the file should be recaptured to eliminate the surrounding white space as much as possible. The following basic program will send and print this file:

```
OPEN .WIZ.PCX. FOR INPUT AS #2
DA$ = INPUT$(15706, #2)
C$ = CHR$(27)
WIDTH .LPT1:., 255
LPRINT C$; .A.;
LPRINT C$; .V150"; C$; .H100"; C$; .GP15706,.; DA$
LPRINT C$; .Q1"; C$; .Z";
CLOSE #2
```

The printer output for this program is:

CUSTOM PROTOCOL CODES

This chapter contains information on creating custom Protocol Command Codes. The Protocol Command Codes tell the printer that a specific type of information is being transmitted to it. As an example, the Standard Protocol Command Code specifies the use of an <ESC>character to tell the printer that the following character(s) will represent a specific command. Sometimes the host computer is unable to generate the character or it uses the <ESC> character to control another function. In this case, an Alternate Protocol Command Code set can be selected for use. When the Alternate set is selected, the <ESC> character is not used and is instead replaced with a “carrot” (^) character. A command stream would then start with an “^” instead of an “<ESC>”. These two sets of Protocol Command Codes are adequate for the majority of all applications, but occasionally situations occur where conflicts exist when using the Alternate set. In these cases, the user can define and download a custom set of Protocol Command Codes that are stored in non-volatile memory in the printer. After these are downloaded, they replace the Alternate Command Code set.

The command for downloading a new set of Protocol Command Codes takes the form of “<ESC>LD,a,b,c,d,e,f,g,h,i,j j”. The parameters specified for “a” through “i” can be transmitted in either ASCII characters or hex notation, allowing a complete 128 character (except for the “,”) set to be used for selecting the custom code.

PROTOCOL COMMAND CODES		
PARAMETER	**STANDARD SETTING**	**ALTERNATE SETTING**
a	STX	{
b	ETX	}
c	ESC	^
d	ENQ	@
e	CAN	!
g	OFFLINE	]
h (Auto Online)	No	0=Yes, 1=No
i (Zero Slash)	No	0=Yes, 1=No
j j (Eurocharacter)	D5	User defined

REFERENCE TABLES

TABLE 1: VALID COMMANDS (<ESC>L)										
Font	<UB>	<XS>	<XM>	<XB>	<XL>	<OA>	<OB>	<K1>	<K2>	<K3>
	<K4>	<K5>	<K8>	<K9>	<KA>	<KB>	<KD>	<k1>	<k2>	<k3>
	<k4>	<k5>	<k8>	<k9>	<kA>	<kB>	<kD>			
Modification	<P>	<RF>								
Graphic	<G>	<GM>	<GP>							
Memory Card	<GR>	<GC>	<PY>							

TABLE 2: VALID COMMANDS (<ESC>P)										
Font	<XU>	<XS>	<XM>	<XB>	<XL>	<OA>	<OB>	<RD>	<$=>	<K1>
	<K2>	<K3>	<K4>	<K5>	<K8>	<K9>	<KA>	<KB>	<KD>	<k1>
	<k2>	<k3>	<k4>	<k5>	<k8>	<k9>	<kA>	<kB>	<kD>	
Barcode	<B>	<D>	<D><d>	<BD>	<BT>	<BW				
Modification	<RF>									

TABLE 3: VALID COMMANDS (<ESC>PR)										
Font	<XU>	<XS>	<XM>	<XB>	<XL>	<RD>	<$=>			
Modification	<RF>									

TABLE 4: VALID COMMANDS (<ESC>PS)										
Font	<XU>	<XS>	<XM>	<XB>	<XL>	<RD>	<$=>			
Modification	<RF>									

TABLE 5: VALID COMMANDS (<ESC>%)										
Font	<XU>	<XS>	<XM>	<XB>	<XL>	<OA>	<OB>	<RD>	<$=>	<K1>
	<K2>	<K3>	<K4>	<K5>	<K8>	<K9>	<KA>	<KB>	<KD>	<k1>
	<k2>	<k3>	<k4>	<k5>	<k8>	<k9>	<kA.	<kB>	<kD>	
Graphic	<G>	<GM>	<GP>							
Barcode	<B>	<BC>	<BG>	<BI>	<BP>	<D>	<D<d>>	<BD>	<BT>	<BW>
2D Code	<BK>	<BQ>	<BV>	<VC>						
Modification	<RF>									
Memory Card	<GR>	<GC>	<PY>							

TABLE 6: VALID COMMANDS (<ESC>F)										
Font	<XU>	<XS>	<XM>	<XB>	<XL>	<OA>	<OB>	<RD>	<$=>	
Barcode	<B>	<BC>	<BG>	<BI>	<BP>	<D>	<D><d>	<BD>	<BT>	<BW>

TABLE 7: VALID COMMANDS (<ESC>&)										
Print Position	<V>	<H>								
Font	<XU>	<XS>	<XM>	<XB>	<XL>	<OA>	<OB>	<RD>	<$=>	<K1>
	<K2>	<K3>	<K4>	<K5>	<K8>	<K9>	<KA>	<KB>	<KD>	<k1>
	<k2>	<k3>	<k4>	<k5>	<k8>	<k9>	<kA>	<kB>	<kD>	
Barcode	<B>	<BC>	<BG>	<BI>	<BP>	<D>	<D><d>	<BD>	<BT>	<BW>
2D Code	<BK>	<BQ>	<BV>	<BX>	<VC>					
Modification	<WD>	<FW>	<(>	<RF>						
Graphic	<G>	<GM>	<GP>							

TABLE 8: VALID COMMANDS (<ESC>/										
Print Position	<V>	<H>								
Font	<XU>	<XS>	<XM>	<XB>	<XL>	<OA>	<OB>	<RD>	<$=>	<K1>
	<K2>	<K8>	<K9>	<k1>	<k2>	<k8>	<k9>			
Barcode	<B>	<BC>	<BG>	<BI>	<BP>	<D>	<D><d>	<BD>	<BT>	<BW>
2D Code	<BK>	<BQ>	<BV>	<BX>	<VC>					
Modification	<WD>	<FW>	<(>	<RF>						
Graphic	<G>	<GM>	<GP>							

TABLE 9: VALID COMMANDS (<ESC>H)										
Font	<XU>	<XS>	<XM>	<XB>	<XL>	<OA>	<OB>	<RD>	<$=>	<K1>
	<K2>	<K3>	<K4>	<K5>	<K8>	<K9>	<KA>	<KB>	<KD>	<k1>
	<k2>	<k3>	<k4>	<k5>	<k8>	<k9>	<kA>	<kB>	<kD>	
Barcode	<B>	<BC>	<BG>	<BI>	<BP>	<D>	<D><d>	<BD>	<BT>	<BW>
2D Code	<BK>	<BQ>	<BV>	<BX>	<VC>					
Modification	<WD>	<FW>	<(>	<RF>						
Graphic	<G>	<GM>	<GP>							
Memory Card	<GR>	<GC>	<PY>							

TABLE 10: VALID COMMANDS (<ESC>V)										
Font	<XU>	<XS>	<XM>	<XB>	<XL>	<OA>	<OB>	<RD>	<$=>	<K1>
	<K2>	<K3>	<K4>	<K5>	<K8>	<K9>	<KA>	<KB>	<KD>	<k1>
	<k2>	<k3>	<k4>	<k5>	<k8>	<k9>	<kA>	<kB>	<kD>	
Barcode	<B>	<BC>	<BG>	<BI>	<BP>	<D>	<D><d>	<BD>	<BT>	<BW>
2D Code	<BK>	<BQ>	<BV>	<BX>	<VC>					
Modification	<WD>	<FW>	<(>	<RF>						
Graphic	<G>	<GM>	<GP>							
Memory Card	<GR>	<GC>	<PY>							

TABLE 11: VALID COMMANDS (<ESC>XU, XS, XM, XB, XL)										
Print Position	<V>	<H>								
Modification	<P>	<L>	<%>	<PS>	<PR>	<F>	<&>	</>	<O>	<WD>
Barcode	<D><d>									
Calendar	<WA>									

TABLE 12: CHARACTER FONT SET (<ESC>XU)

W5 X H9 CHARACTER SIZE, 12 DOTS/MM HEAD DENSITY, THREE-FOLD HEIGHT/WIDTH

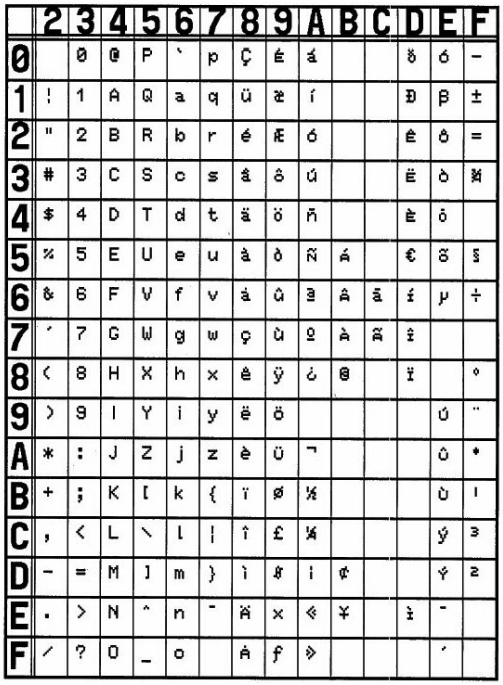


TABLE 13: CHARACTER FONT SET (<ESC>XS)

W17 X H17 CHARACTER SIZE, 12 DOTS/MM HEAD DENSITY, TWO-FOLD HEIGHT/WIDTH

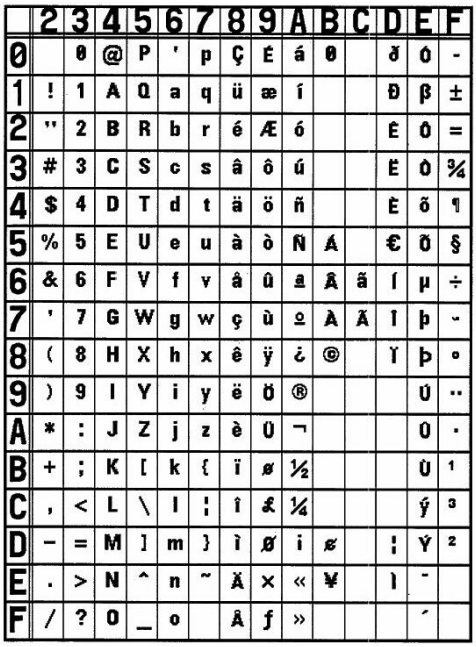


TABLE 14: CHARACTER FONT SET (<ESC>XM)

W24 X H24 CHARACTER SIZE, 12 DOTS/MM HEAD DENSITY, ONE-FOLD HEIGHT/WIDTH

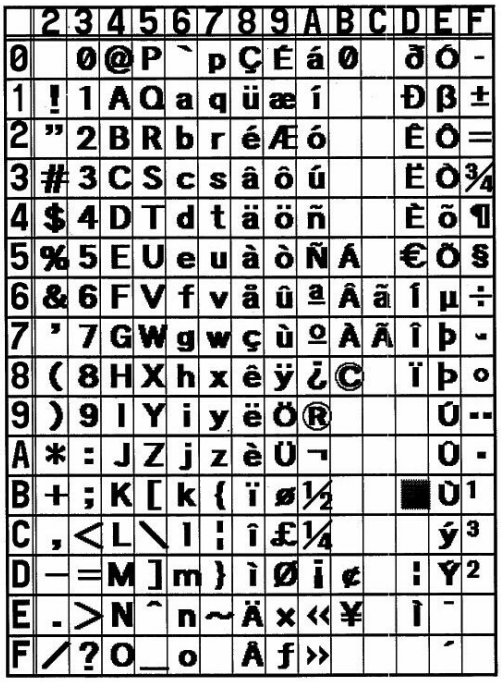


TABLE 15: CHARACTER FONT SET (<ESC>XB)

W48 X H48 CHARACTER SIZE, 12 DOTS/MM HEAD DENSITY, ONE-FOLD HEIGHT/WIDTH

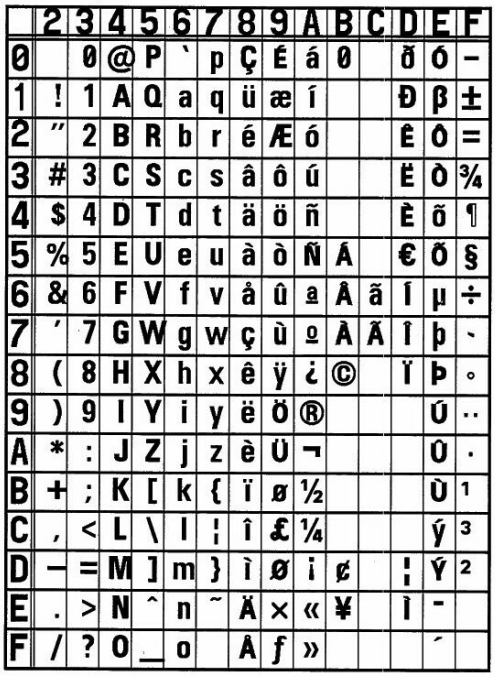


TABLE 16: CHARACTER FONT SET (<ESC>XL)

W48 X H48 CHARACTER SIZE, 12 DOTS/MM HEAD DENSITY, ONE-FOLD HEIGHT/WIDTH

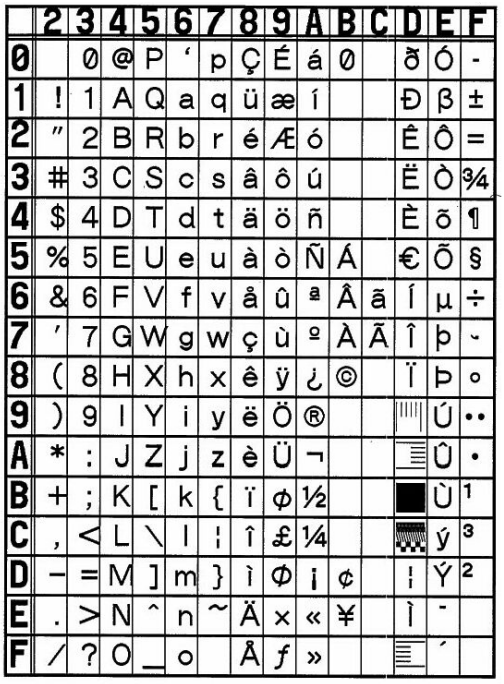


TABLE 17: VALID COMMANDS (<ESC>OA, OB)

Print Position	<V>	<H>								
Modification	<P>	<L>	<%>	<F>	<&>	</>	<O>	<WD>		
Barcode	<D><d>									
Calendar	<WA>									

TABLE 18: CHARACTER FONT SET (<ESC>OA)

W24 X H24 CHARACTER SIZE, 12 DOTS/MM HEAD DENSITY, ONE-FOLD HEIGHT/WIDTH

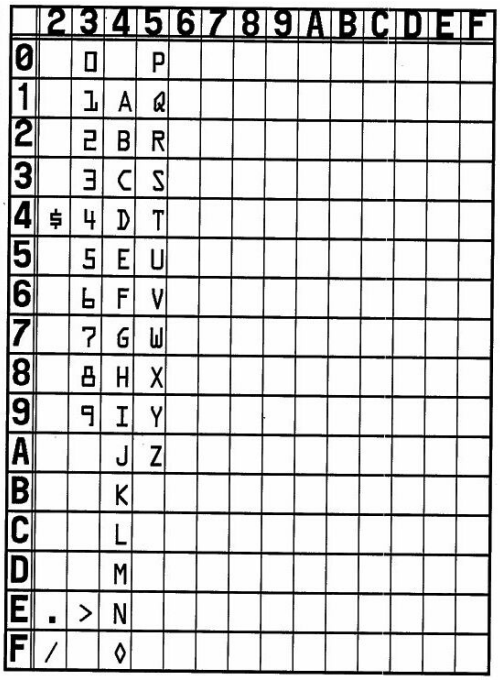


TABLE 19: CHARACTER FONT SET (<ESC>OB)

W24 X H24 CHARACTER SIZE, 12 DOTS/MM HEAD DENSITY, ONE-FOLD HEIGHT/WIDTH

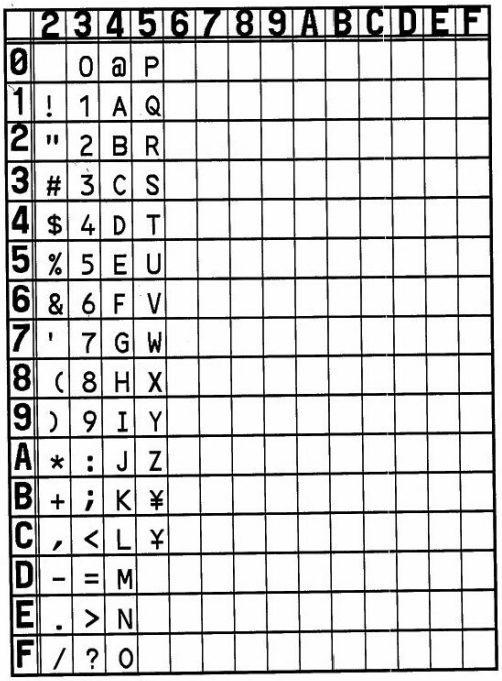


TABLE 20: VALID COMMANDS (<ESC>RD)										
Print Position	<V>	<H>								
Modification	<P>	<%>	<F>							

TABLE 21: VALID COMMANDS (<ESC>$)										
Modification	<$=>									

TABLE 22: VALID COMMANDS (<ESC>$=)										
Print Position	<V>	<H>								
Modification	<P>	<%>	<$>	<F>						
Calendar	<WA>									

TABLE 23: BARCODE TYPE (<ESC>B)			
A	**BARCODE**	**DESCRIPTION**	**RATIO**
0	NW-7 (Codabar)	Set print data including the Start/Stop characters. A, B, C, D, E, N, T, a, b, c, d, e, n, t. When the barcode print data is [123], specify [A123A]. Barcode character pitch is enabled. For print data, refer to the NW-7 code table.	1:3
1	CODE39	Set print data to include the Start/Stop Character [*]. When the barcode print data is [12345], specify [*12345*]. Barcode character pitch is enabled. For print data, refer to the CODE39 code table.	1:3
2	Interleaved 2 of 5	Specify the print data in even-numbered digits. If specifying an odd-numbered digit, "0" will be added to the head of the print data. For print data, refer to the Interleaved 2 of 5 code table.	1:3
3	JAN/EAN13	The barcode will not have a guard bar and human readable information. For print data, refer to the JAN/EAN13 code table.	Fixed
4	JAN/EAN8	The barcode will not have a guard bar and human readable information. For print data, refer to the JAN/EAN13 code table.	Fixed
5	Industrial 2 of 5	The barcode character pitch is enabled. For print data, refer to the Industrial 2 of 5 code table.	1:3
6	Matrix 2 of 5	The barcode character pitch is enabled. For print data, refer to the Matrix 2 of 5 code table.	1:3
A	MSI	The print data can be specified up to 13 digits.	Fixed
C	CODE93	Refer to CODE93 <BC>.	Fixed
E	UPC-E	Specify a 6 digit number for print data.	Fixed
F	BOOKLAND	Specify a 2 to 5 digit number for print data.	Fixed
G	CODE128	Refer to CODE128 <BG>.	Fixed
H	UPC-A	The barcode will not have a guard bar and human readable information. For print data, refer to the UPC-A code table.	Fixed
I	UCC/EAN128	Refer to UCC/EAN128 <BI>.	Fixed
P	POSTNET	Specify in 5, 6, 9, or 11 digits.	Fixed

TABLE 24: BARCODE TYPE (<ESC>BD)			
A	**BARCODE**	**DESCRIPTION**	**RATIO**
0	NW-7 (Codabar)	Set print data including the Start/Stop characters. A, B, C, D, E, N, T, a, b, c, d, e, n, t. When the barcode print data is [123], specify [A123A]. Barcode character pitch is enabled. For print data, refer to the NW-7 code table.	2:5
1	CODE39	Set print data to include the Start/Stop Character [*]. When the barcode print data is [12345], specify [*12345*]. Barcode character pitch is enabled. For print data, refer to the CODE39 code table.	2:5
2	Interleaved 2 of 5	Specify the print data in even-numbered digits. If specifying an odd-numbered digit, "0" will be added to the head of the print data. For print data, refer to the Interleaved 2 of 5 code table.	2:5
3	JAN/EAN13	The barcode will not have a guard bar and human readable information. For print data, refer to the JAN/EAN13 code table.	Fixed
4	JAN/EAN8	The barcode will not have a guard bar and human readable information. For print data, refer to the JAN/EAN13 code table.	Fixed
5	Industrial 2 of 5	The barcode character pitch is enabled. For print data, refer to the Industrial 2 of 5 code table.	2:5
6	Matrix 2 of 5	The barcode character pitch is enabled. For print data, refer to the Matrix 2 of 5 code table.	2:5
H	UPC-A	The barcode will not have a guard bar and human readable information. For print data, refer to the UPC-A code table.	Fixed
NOTE: The model composition ratio may not be available for some barcode types.			

TABLE 25: BARCODE TYPE (<ESC>D)			
A	**BARCODE**	**DESCRIPTION**	**RATIO**
0	NW-7 (Codabar)	Set print data including the Start/Stop characters. A, B, C, D, E, N, T, a, b, c, d, e, n, t. When the barcode print data is [123], specify [A123A]. Barcode character pitch is enabled. For print data, refer to the NW-7 code table.	1:2
1	CODE39	Set print data to include the Start/Stop Character [*]. When the barcode print data is [12345], specify [*12345*]. Barcode character pitch is enabled. For print data, refer to the CODE39 code table.	1:2
2	Interleaved 2 of 5	Specify the print data in even-numbered digits. If specifying an odd-numbered digit, "0" will be added to the head of the print data. For print data, refer to the Interleaved 2 of 5 code table.	1:2
3	JAN/EAN13	The barcode will not have a guard bar and human readable information. For print data, refer to the JAN/EAN13 code table.	Fixed
4	JAN/EAN8	The barcode will not have a guard bar and human readable information. For print data, refer to the JAN/EAN13 code table.	Fixed
5	Industrial 2 of 5	The barcode character pitch is enabled. For print data, refer to the Industrial 2 of 5 code table.	1:2
6	Matrix 2 of 5	The barcode character pitch is enabled. For print data, refer to the Matrix 2 of 5 code table.	1:2
H	UPC-A	The barcode will not have a guard bar and human readable information. For print data, refer to the UPC-A code table.	Fixed
NOTE: The model composition ratio may not be available for some barcode types.			

TABLE 26: CODE128 DATA VALUES (<ESC>BG)							
VALUE	**SUBSET A**	**SUBSET B**	**SUBSET C**	**VALUE**	**SUBSET A**	**SUBSET B**	**SUBSET C**
0	SP	SP	00	**36**	D	D	36
1	!	!	01	**37**	E	E	37
2	“	“	02	**38**	F	F	38
3	#	#	03	**39**	G	G	39
4	$	$	04	**40**	H	H	40
5	%	%	05	**41**	I	I	41
6	&	&	06	**42**	J	J	42
7	‘	‘	07	**43**	K	K	43
8	.	.	02	**38**	F	F	38
9	)	)	09	**45**	M	M	45
10	*	*	10	**46**	N	N	46
11	+	+	11	**47**	O	O	47
12	,	,	12	**48**	P	P	48
13	-	-	13	**49**	Q	Q	49
14	.	.	14	**50**	R	R	50
15	/	/	15	**51**	S	S	51
16	0	0	16	**52**	T	T	52
17	1	1	17	**53**	U	U	53
18	2	2	18	**54**	V	V	54
19	3	3	19	**55**	W	W	55
20	4	4	20	**56**	X	X	56
21	5	5	21	**57**	Y	Y	57
22	6	6	22	**58**	Z	Z	58
23	7	7	23	**59**	[	[	59
24	8	8	24	**60**	\	\	60
25	9	9	25	**61**	]	]	61
26	:	:	26	**62**	^	^	62
27	;	;	27	**63**	__	__	63
28	<	<	28	**64**	NUL>(space)	. >(space)	64
29	=	=	29	**65**	SOH >!	a or >!	65
30	>J	>J	30	**66**	STX >"	b or >"	66
31	?	?	31	**67**	ETX >#	c or >#	67
32	@	@	32	**68**	EOT >$	d or >$	68
33	A	A	33	**69**	ENQ >%	e or >%	69
34	B	B	34	**70**	ACK >&	f or >&	70
35	C	C	35	**71**	BEL >.	g or >.	71
72	BS >(	h >(	72	**89**	EM >9	y >9	89
73	HT >)	i >)	73	**90**	SUB >:	z >:	90
74	LF >*	j >*	74	**91**	ESC >;	{ >;	91
75	VT >+	k >+	75	**92**	FS ><	| ><	92
76	FF >,	l >,	76	**93**	GS >=	} >=	93
77	CR >-	m >-	77	**94**	RS >>	~ >>	94
78	SO >.	n >.	78	**95**	US >?	DEL >?	95
79	SI >/	o >/	79	**96**	FNC3 >@	FNC3 >@	96
80	DLE >0	p >0	80	**97**	FNC2 >A	FNC2 >A	97
81	DC1 >1	q >1	81	**98**	SHIFT >B	SHIFT >B	98

TABLE 26: CODE128 DATA VALUES (<ESC>BG)							
VALUE	**SUBSET A**	**SUBSET B**	**SUBSET C**	**VALUE**	**SUBSET A**	**SUBSET B**	**SUBSET C**
82	DC2 >2	r >2	82	**99**	Subset C >C	Subset C >C	99
83	DC3 >3	s >3	83	**100**	Subset B >D	FNC4 >D	Subset B >D
84	DC4 >4	t >4	84	**101**	FNC4 >E	Subset A >E	Subset A >E
85	NAK >5	u >5	85	**102**	FNC1 >F	FNC1 >F	FNC1 >F
86	SYN >6	v >6	86	**103**	SUBSET A START CODE >G		
87	ETB >7	w >7	87	**104**	SUBSET B START CODE .H		
88	CAN >8	x >8	88	**105**	SUBSET C START CODE >I		

TABLE 27: FORMAT ID LIST (<ESC>BX)						
ERROR CORRECTION	**FORMAT ID**					
	01	02	03	04	05	06
00 (ECC000)	500	452	394	413	310	271
05 (ECC050)	457	333	291	305	228	200
08 (ECC080)	402	293	256	268	201	176
10 (ECC100)	300	218	190	200	150	131
14 (ECC140)	144	105	91	96	72	63
20 (ECC200)	Numeric			3116		
	Alphanumeric			2335		
	Binary (01h ~ FFh)			1556		

TABLE 28: PARAMETERS (<ESC>PG)		
#	**ITEM**	**DESCRIPTION**
a	Print Mode	00H Thermal Transfer 01H Direct Thermal
b	Not used.	00H Fixed
c	Print Speed: 8 dots/mm Initial Value: 02H (4 inch/s) Range: 2 to 10 inch/s Print Speed: 12 dots/mm Initial Value: 02H (4 inch/s) Range: 2 to 10 inch/s	00H 2 inch/s 01H 3 inch/s 02H 4 inch/s 03H 5 inch/s 04H 6 inch/s 05H 7 inch/s 06H 8 inch/s 07H 9 inch/s 08H 10 inch/s
d	Operation Mode	00H Continuous 01H Tear-Off 02H Cutter 03H Dispenser
e	Not used	00H Fixed
f	Not used	00H Fixed
g	Not used	00H Fixed
h	Print Darkness	00H - 01H + (Initial Value)

TABLE 28: PARAMETERS (<ESC>PG)		
#	**ITEM**	**DESCRIPTION**
h	Print Darkness Level	00H Darkness 0 01H Darkness 1 02H Darkness 2 03H Darkness 3 04H Darkness 4 05H Darkness 5 (Initial Value) 06H Darkness 6 07H Darkness 7 08H Darkness 8 09H Darkness 9 0AH Darkness 10 0BH Darkness 11 0CH Darkness 12 0DH Darkness 13 0EH Darkness 14 0FH Darkness 15
i	Sensor Type	00H Reflective Sensor 1 01H See-through Sensor 02H Sensor - Ignoring type
j	Zero Slash	00H Disable 01H Enable (Initial Value)
k	Kanji Code	00H JIS Code (Initial Value) 01H Shift JIS Code
l	Not Used	00H Fixed
m	Not used	00H Fixed
n	Proportional Pitch	00H Fixed Pitch 01H Proportional Pitch (Initial Value)
o	Label Height (dots) (Initial value for 203dpi : C80H) (Initial value for 305dpi : 12C0H)	8 dots/mm : [15H to 4E94H] (21 to 20115) 12 dots/mm : [1FH to 75DFH] (31 to 30175)
p	Label Width (dots) (initial value for 203dpi : 340H) (Initial value for 305dpi : 4E0H)	8 dots/mm : [15H to 340H] (21 to 832) 12 dots/mm : [1FH to 4E0H] (31 to 1248)
q	Vertical Start Point Correction (dots) (Initial value : 00H)	00H to 318H (0 to 792) FFFFH to FCE8H (-1 to -792)
r	Horizontal Start Point Correction (dots) (Initial value : 00H)	00H to 318H (0 to 792) FFFFH to FCE8H (-1 to -792)
s	Not Used	00H Fixed
t	Not Used	00H Fixed
u	Not Used	00H Fixed
v	Not Used	00H Fixed
w	Not Used	00H Fixed
x	Not Used	00H Fixed
y	Buzzer sound setting	00H Yes (Initial value) 01H No

TABLE 29: PARAMETERS (<ESC>PC)			
#	**ITEM #**	**ITEM**	**DESCRIPTION**
b	1	Not used.	0 Fixed
c	2	Not used.	0 Fixed
d	3	Print Speed: 8 dots/mm Initial Value: 2 (4 inch/s) Range: 2 to 10 inch/s Print Speed: 12 dots/mm Initial Value: 2 (4 inch/s) Range: 2 to 10 inch/s	0 2 inch/s 1 3 inch/s 2 4 inch/s 3 5 inch/s 4 6 inch/s 5 7 inch/s 6 8 inch/s 7 9 inch/s 8 10 inch/s
e	4	Not used.	0 Fixed
f	5	Not used.	0 Fixed
g	6	Not used.	0 Fixed
h	7	Not used.	0 Fixed
i1	8	Print Darkness	0 - 1 + (Initial value : 1)
i2	9	Print Darkness Level	0 Darkness 0 1 Darkness 1 2 Darkness 2 3 Darkness 3 4 Darkness 4 5 Darkness 5 (Initial value) 6 Darkness 6 7 Darkness 7 8 Darkness 8 9 Darkness 9 A Darkness 10 B Darkness 11 C Darkness 12 D Darkness 13 E Darkness 14 F Darkness 15
j	10	Not Used	0 Fixed
k	11	Zero Slash	0 Disabled 1 Enabled (Initial value)
l	12	Kanji Code	0 JIS Code (Initial value) 1 Shift JIS Code
m	13	Not Used	0 Fixed
n	14	Not Used	0 Fixed
o	15	Proportional Pitch	0 Fixed Pitch 1 Proportional Pitch (Initial value)
p	16	Label Height (dots)	8 dots/mm : 21 to 20115 12 dots/mm : 31 to 30175
q	17	Label Width (dots)	8 dots/mm : 21 to 832 12 dots/mm : 31 to 1248
r	18	Vertical Start Point Correction dots) (Initial value : 0)	-792 to 792
s	19	Horizontal Start Point Correction (dots) (Initial value : 0)	-792 to 792
t	20	Not Used	0 Fixed
u	21	Not Used	0 Fixed
v	22	Not Used	0 Fixed
w	23	Not Used	0 Fixed
x	24	Not Used	0 Fixed
y	25	Not Used	0 Fixed

TABLE 29: PARAMETERS (<ESC>PC)			
#	**ITEM #**	**ITEM**	**DESCRIPTION**
z	26	Buzzer sound setting (Initial value : 0)	0 Yes 1 No

TABLE 30: PARAMETERS (<ESC>LD)				
FUNCTION	**PARAMETER**	**CONTENT**	**STANDARD DEFAULT**	**NON-STANDARD DEFAULT**
Proto Code	a (Hex) b (Hex) c (Hex) d (Hex) e (Hex) f (Hex) g (Hex)	STX ETX ESC ENQ CAN NULL Offline	02H 03H 1BH 05H 18H 00H 40H	{ (7BH) } (7DH) ^ (5EH) @ (5EH) ! (21H) - (7EH)] (5DH)
Auto Online	h (ASCII)	0: Yes, 1: No	0 (30H)	0 (30H)
Zero Slash	i (ASCII)	0: Yes, 1: No	0 (30H)	0 (30H)
Euro Code	j (Hex)	D5H	D5H	D5H

TABLE 31: VALID COMMANDS (<ESC>YS)										
Print Position	<V>	<H>								
Font	<XU>	<XS>	<XM>	<XB>	<XL>	<OA>	<OB>	<RD>	<$=>	<K1>
	<K2>	<K3>	<K4>	<K5>	<K8>	<K9>	<KA>	<KB>	<KD>	<k1>
	<k2>	<k3>	<k4>	<k5>	<k8>	<k9>	<kA.	<kB>	<kD.	
Barcode	<B>	<BC>	<BG>	<BI>	<BP>	<D>	<D<d>>	<BD>	<BW>	
Modification	<P>	<L>	<PS>	<PR>	<%>	<FW>	<(>	<WD>		
System	<A1>	<A3>	<AX>	<AR>						
Graphic	<G>	<GM>	<GP>							
Memory Card	<&R>	</N>	<GR>	<GC>	<PY>					

TABLE 32: INVALID COMMANDS (<ESC>YS)		
CLASS	**COMMAND**	**COMMAND NAME**
Control	<ESC>Q	Label Quantity
	<ESC>ID	Job ID Number
	<ESC>WK	Job Name
Modification	<ESC>&	Form Overlay Store
	<ESC>F	Sequential Numbering
	<ESC>0	Partial Edit
	<ESC>RM	Mirror Rotation
Barcode	<ESC>BT	Variable Ration Barcodes
2D Code	<ESC>BQ	QR Code
	<ESC>VC	Veri Code
	<ESC>BV	Maxi Code
	<ESC>BK	PDF417
	<ESC>BX	Data Matrix Code
Graphic	<ESC>G	Graphic Printing

TABLE 32: INVALID COMMANDS (<ESC>YS)		
CLASS	**COMMAND**	**COMMAND NAME**
System	<ESC>CS	Print Speed
	<ESC>#E	Print Darkness
	<ESC>~	Cut, Job
	<ESC>C	Reprint
	<ESC>*	Clear (Memory Card)
	<ESC>@	Offline
	<ESC>OL	Online
Memory Card	<ESC>BJF	Card Format
	<ESC>GI	Graphic, Store
	<ESC>GT	BMP File, Store
	<ESC>PI	PCX File, Store
	<ESC>/D	Field, Recall
	<ESC>BJS	Print Memory Card Status
	<ESC>EX	Print Length Expansion

TABLE 33: VALID COMMANDS (<ESC>&R)										
Print Position	<V>	<H>								
Font	<XU>	<XS>	<XM>	<XB>	<XL>	<OA>	<OB>	<RD>	<$=>	<K1>
	<K2>	<K8>	<K9>	<k1>	<k2>	<k8>	<k9>			
Barcode	<B>	<BC>	<BG>	<BI>	<BP>	<D>	<D<d>>	<BD>	<BT>	<BW>
2D Code	<BK>	<BQ>	<BV>	<BX>	<VC>					
Modification	<WD>	<FW>	<(>	<RF>						
Graphic	<G>	<GM>	<GP>							

TABLE 34: VALID COMMANDS (<ESC>&S)										
Print Position	<V>	<H>								
Font	<XU>	<XS>	<XM>	<XB>	<XL>	<OA>	<OB>	<RD>	<K1>	<K2>
	<K3>	<K4>	<K5>	<K8>	<K9>	<KA>	<KB>	<KD>	<k1>	<k2>
	<k3>	<k4>	<k5>	<k8>	<k9>	<kA>	<kB>	<kD>		
Barcode	<B>	<BC>	<BG>	<BL>	<BP>	<D>	<D><d>	<BD>		
2D Code	<BK>	<BQ>	<BV>	<BX>	<VC>					
Modification	<WD>	<FW>	<(>	<RF>						
Graphic	<G>	<GM>	<GP>							

TABLE 35: ERROR COMMANDS (<ESC>&S)			
COMMAND	**DESCRIPTION**	**COMMAND**	**DESCRIPTION**
<ESC>A	Data Transmission Start	**<ESC>***	Clear (Memory Card)
<ESC>Z	Data Transmission End	**<ESC>BT**	Variable Ratio Barcodes
<ESC>C	Reprint	**<ESC>BW**	Barcode Expansion
<ESC>0	Partial Edit	**<ESC>&**	Form Overlay, Store
<ESC>A3	Start Point Correction	**<ESC>YS**	Format, Store
<ESC>CS	Print Speed	**<ESC>/N**	Field, Store
<ESC>#E	Print Darkness	**<ESC>GI**	Graphic, Store
<ESC>@	Offline	**<ESC>PI**	PCX File, Store
<ESC>ID	Job ID Number	**<ESC>BJF**	Card, Format

TABLE 35: ERROR COMMANDS (<ESC>&S)			
COMMAND	**DESCRIPTION**	**COMMAND**	**DESCRIPTION**
<ESC>CC	Card Slot for Use	**<ESC>EX**	Print Length Expansion
<ESC>BJS	Print Memory Card Status	**<ESC>GT**	BMP File, Store
<ESC>~	Cut, Job	**<ESC>F**	Sequential Numbering

TABLE 36: VALID COMMANDS (<ESC>/N)										
Font	<XU>	<XS>	<XM>	<XB>	<XL>	<OA>	<OB>	<RD>	<$=>	<K1>
	<K2>	<K3>	<K4>	<K5>	<K8>	<K9>	<KA>	<KB>	<KD>	<k1>
	<k2>	<k3>	<k4>	<k5>	<k8>	<k9>	<kA.	<kB>	<kD.	
Barcode	<B>	<BC>	<BG>	<BI>	<BP>	<D>	<D<d>>	<BD>	<BT>	<BW>

TABLE 37: SPECIFIED ITEM STATUS		
DESCRIPTION	**ASCII**	**HEX**
Received	00	3030
Issued	01	3031
Cancel	02	3032
Item Number Error	03	3033
BCC Error (Block Check Code)	04	3034
Designation of issue creating error occurrence	05	3035
Cancel after error occurrence	06	3036
Analyzing unprinted items	07	3037
Unprocessed error due to removal of power supply.	08	3038
	**	2A2A

TABLE 38: ITEM STATUS IN PROCESS			
DIGIT	**DESCRIPTION**	**ASCII**	**HEX**
1	Offline	0	30
	Online - Wait to Receive.	1	31
	Online - Printing.	2	32
	Online - Standby (wait to dispense/cut).	3	33
	Online - Analyzing and Editing.	4	34
	Error	5	35
	Printer Paused (when receiving DLE command).	6	36

TABLE 38: ITEM STATUS IN PROCESS			
DIGIT	**DESCRIPTION**	**ASCII**	**HEX**
2	No Error.	0	30
	Ribbon Near End.	1	31
	Buffer Near Full.	2	32
	Ribbon Near End & Buffer Near Full	3	34
	Label Near End	4	34
	Label Near End & Ribbon Near End	5	35
	Label Near End & Buffer Near Full	6	36
	Label Near End & Ribbon Near End & Buffer Near Full	7	37
	Machine Error	A	41
	Flash ROM Error	B	42
	Head Open	C	43
	Paper End	D	44
	Ribbon End	E	45
	Sensor Error	F	46
	Head Error	G	47
	Cartridge Read/Write Error	H	48
	Cartridge Full	I	49
	Cutter Error	J	4A
	Calendar Error	K	4B
	Rewind Full	M	4D
	Cutter Open	N	4E
	RFID Tag Error	O	4F
	RFID Protect Error	P	50
	BCC Error	Q	51
	Item Number Error	R	52
	Media Error	S	53
2	Nonlock Error	T	54
	Other Error	U	55

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